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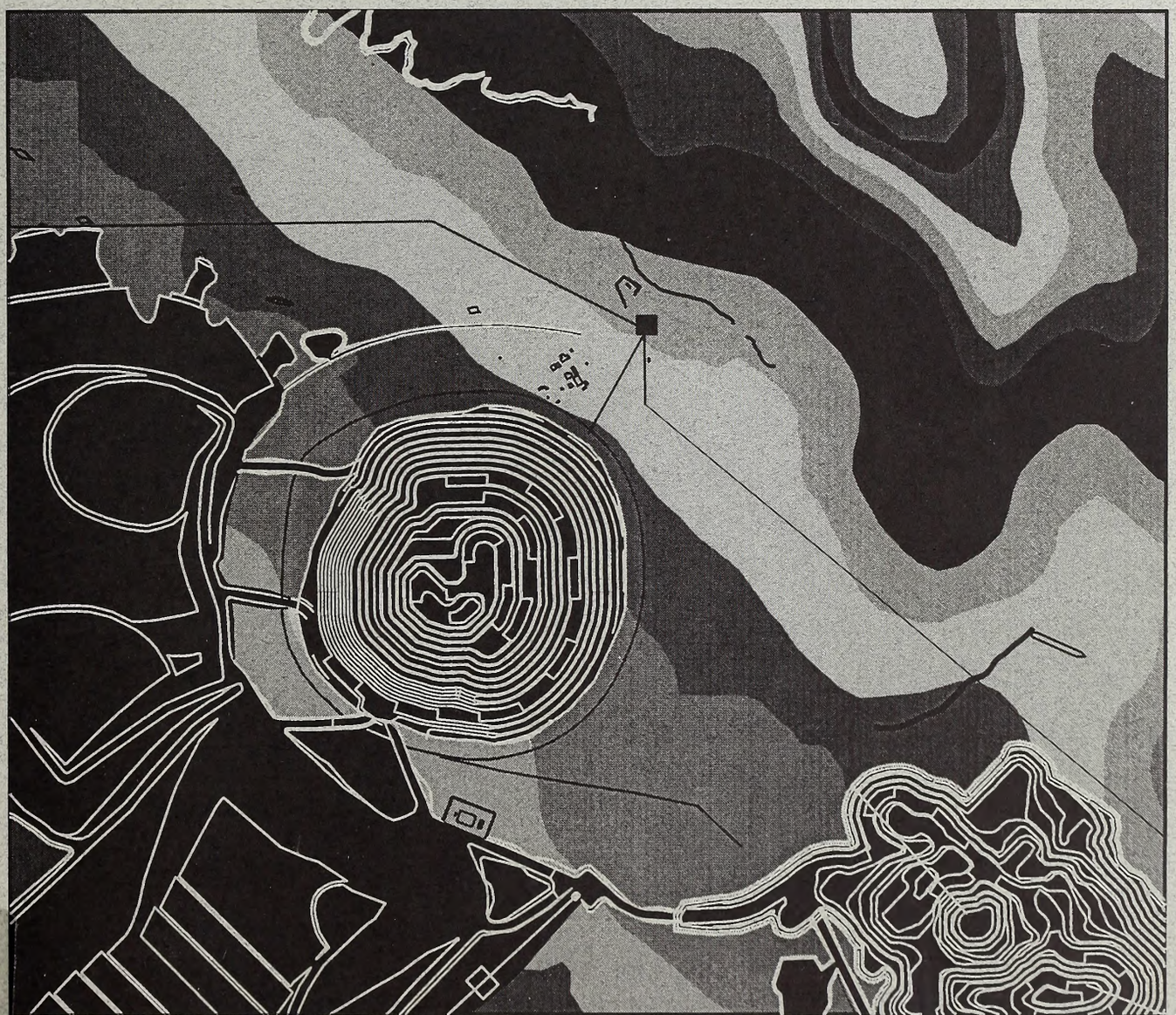
U.S. Department of the Interior

Bureau of Land Management
Arizona State Office

Safford Field Office

September 1998

Draft
Environmental Impact Statement
Dos Pobres/San Juan Project
Volume 1



Cooperating Agencies:

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S.D.I. Bureau of Indian Affairs

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BLM/AZ/PL-98/016

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Safford District Office
711 14th Avenue
Safford, AZ 85546
(520) 348-4400

In reply refer to:
3809 AZA 29640 (04227)

September 25, 1998

Dear Reader:

The Bureau of Land Management (BLM) has prepared a draft environmental impact statement (DEIS) in response to a proposed mining plan of operations, with a land exchange alternative, submitted to the Safford Field Office by Phelps Dodge, Inc. The proposal, called the Dos Pobres-San Juan project, consists of two open pit copper mines utilizing one central ore processing facility in Graham County. The DEIS documents the analysis of potential environmental and socioeconomic impacts of the proposed mining project.

In the past, you have indicated an interest in the proposed mine. Enclosed is a copy of the DEIS for your review and comment. We request your comments on the document. The comments most useful to us are substantive ones that address specific concerns, issues, or technical matters. Comments will be individually and collectively considered in preparing the final EIS.

The comment period is open for 60 days, beginning on September 25, 1998. **All comments will be accepted until November 25, 1998.** Please note that comments, including names and street addresses of respondents, are available for public review and may be published as part of the final EIS, or other related documents. Individual respondents may request confidentiality. **If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently in your written comment.** Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

You are invited to attend public hearings to be held on the following dates:

Safford, October 27, 1998

Tucson, October 28, 1998

Phoenix, October 29, 1998

Times and locations to be announced.

Written comments should be sent to Tom Terry, Project Manager, Bureau of Land Management, Safford Field Office, 711 14th Avenue, Safford, Arizona 85546. Please call him if you have any questions at (520) 348-4400. We welcome your comments to assist us throughout the EIS process.

Sincerely,

William T. Civish
Field Office Manager

ID:88058395

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U.S. Department of Interior
Bureau of Land Management

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

for the

DOS POBRES/SAN JUAN PROJECT

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prepared by

Safford Field Office

September 1998

Denise P. Meridith
Arizona State Director

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dos Pobres/San Juan Project
Graham County, Arizona

Lead Agency:	U.S.D.I. Bureau of Land Management Safford Field Office
Cooperating Agencies:	U.S. Army Corps of Engineers Los Angeles District Regulatory Branch
	U.S. Environmental Protection Agency Region IX Water Management Division
	U.S.D.I Bureau of Indian Affairs Phoenix Area Office
Authorizing Official:	Denise P. Meridith, State Director BLM Arizona State Office
For More Information:	Tom Terry, Project Leader Bureau of Land Management Safford Field Office 711 14th Avenue Safford, AZ 85546 (520) 348-4400

Abstract

This Draft Environmental Impact Statement describes and analyzes the potential direct, indirect, and cumulative impacts of five alternatives considered for development of the mineral resources associated with the Dos Pobres and San Juan leachable copper ore deposits. The proposed Dos Pobres/San Juan Project is an integrated project using conventional open pit mining and solution extraction/electrowinning technologies to meet a continuing demand for copper. Three mine plan alternatives (Proposed Action, Partial Backfill, and No Action) and two land exchange alternatives (Land Exchange and No Land Exchange) were considered. The BLM's preferred alternative is the Land Exchange alternative in which Phelps Dodge acquires title to the selected lands; the COE's preferred alternative is the least environmentally damaging, practicable alternative in the Mine Plan Alternatives Set; and the EPA may also select an environmentally preferable action alternative. The Proposed Action and Partial Backfill alternatives would result in adverse impacts, most mitigable, to public access and dispersed recreation, grazing, surface water rights, visual resources, soils, groundwater quantity, surface water quantity, waters of the U.S. (Including wetlands), vegetation, wildlife, archaeological and cultural resources. Beneficial impacts would accrue to the local and regional economy. The Land Exchange alternative would result in beneficial impacts to public lands management, public access and recreation, habitats for listed species, and federal jurisdiction of archaeological resources. All of the impacts listed for the Proposed Action alternative would also occur under the Land Exchange alternative assuming the COE and EPA authorized their respective CWA permits for the proposed mine plan. Cumulative impacts of the Project include land tenure, visual resources, ground and surface water resources, vegetation and wildlife, and waters of the United States. Mitigation and monitoring measures are proposed for impacts to land use, physical resources, and cultural resources. An environmental justice review of adverse impacts showed that minority and/or low income groups are not disproportionately impacted by any of the alternatives.

EIS Number:	BLM/AZ/PL-98/016
EPA Notice of Filing Date:	September 25, 1998
Comments Must Be Received By:	November 25, 1998

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SUMMARY

Per the requirement at 40 CFR 1502.12, this section is a summary of the Dos Pobres/San Juan Project Environmental Impact Statement. It focuses on the purpose and need for the Dos Pobres/San Juan Project, alternatives considered, scoping issues analyzed, and impacts of the alternatives.

The Proposed Action analyzed in this Environmental Impact Statement (EIS) is a Mining Plan of Operations (MPO) submitted to the Safford Field Office of the Bureau of Land Management (BLM), by Phelps Dodge Safford, Inc. (PDSI) for the Dos Pobres/San Juan Project (Project). As proposed in the MPO, the Dos Pobres/San Juan Project, located near Safford, Arizona, would consist of two open pit copper mines with one leach pad, one shared solution extraction/electrowinning (SX/EW) processing facility, and shared infrastructure and support facilities. In addition to the MPO, the BLM is considering a land exchange alternative with Phelps Dodge (PD) that would enable the Dos Pobres/San Juan Project to proceed without BLM oversight, assuming that PDSI is able to obtain all necessary environmental permits. Authorizing the MPO or approving the land exchange constitutes two separate but related federal actions, both of which are addressed in this single EIS per the National Environmental Policy Act (NEPA) of 1969. All the alternatives, with the exception of the No Action alternative under the Mining Plan Alternatives Set, would result in development of the Dos Pobres/San Juan Project within the constraints of federal and state environmental permitting requirements.

The BLM, as the primary decision-making agency for these actions, has determined that an EIS is required and is serving as the lead agency responsible for preparation of the EIS. Cooperating agencies include the U.S. Army Corps of Engineers (COE) and the Environmental Protection Agency (EPA), both of which have permitting responsibilities under Sections 404 and 402, respectively, of the Clean Water Act for the proposed mining operations. The Bureau of Indian Affairs (BIA), as a trustee for natural resources of the San Carlos Apache Tribe and the Gila River Indian Community, is also a cooperating agency and is providing special expertise in issues involving cultural resources and Indian Trust Resources. BIA has no permitting authority for this Project.

PURPOSE AND NEED

The purpose and need for the proposed action (the Dos Pobres/San Juan Project) is to develop the mineral resources associated with the Dos Pobres and San Juan leachable copper ore deposits as an integrated project using conventional open pit mining and solution extractions/electrowinning (SX/EW) technologies to meet a continuing demand for copper. A federal land exchange alternative is also consistent with the purpose and need for the proposed action. The land exchange would still allow development of the Dos Pobres and San Juan ore deposits should Phelps Dodge obtain the required federal and state permits to do so. Under either an MPO or a land exchange scenario, the Dos Pobres/San Juan Project must be permitted by the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act, U.S. Environmental Protection Agency (EPA) under Section 402 (National Pollutant Discharge Elimination System) of the Clean Water Act, and Arizona Department of Environmental Quality (ADEQ) under Arizona Revised Statutes (ARS) 49-241 and 49-408 (Aquifer Protection Permit and Air Quality Permit) prior to implementing proposed mining operations. Both the proposed action alternative and the land exchange alternative are in conformance with the Safford District Resource Management Plan, as adopted in the Partial Record of Decision I (BLM 1992) and the Partial Record of Decision II (BLM 1994).

ALTERNATIVES

The five alternatives evaluated in this EIS are presented in two sets: the Mine Plan Alternatives Set and the Land Exchange Alternatives Set. Each set includes a "no action" alternative pertinent to the agency decisions available within that set. The BLM, as a public lands management agency, must decide whether to approve the land exchange or not; selection of the exchange would negate the need for BLM to select an alternative from the Mine Plan Alternatives Set, as BLM has no jurisdiction for mining on private lands. COE and EPA, whose jurisdiction over the Project stems from Clean Water Action Section 404 and 402 permitting, can only select an alternative from the Mine Plan Alternatives Set.

The BLM's preferred alternative is the Land Exchange alternative; the COE's preferred alternative is the least environmentally damaging, practicable alternative; and the EPA's preferred alternative is the least environmentally damaging alternative, although the EPA may select another alternative as its preferred action alternative.

Mine Plan Alternatives Set

Proposed Action Alternative

The Dos Pobres/San Juan Project (the Project) is an integrated mining operation that includes the development of two open pit mines, a crushing and material handling system, a common Solution Extraction/Electrowinning (SX/EW) processing facility and shared infrastructure and support facilities. Based upon the current Mining Plan of Operations, the Project will produce approximately 2.9 billion pounds of salable copper over the Project's estimated 16-year mine production life. Project production will include the mining of 626 million tons of oxide and sulfide leach ore and 385 million tons of lower grade and unmineralized material referred to herein as development rock. Total minable material amounts to 1.01 billion tons resulting in a 0.6:1.0 non-ore to ore ratio. Construction of the SX/EW plant and associated support facilities will require approximately 15 months to complete and will start after completion of the Project's environmental permitting requirements. Construction of the crushing and material handling system is planned to begin about two years after construction of the SX/EW plant. The Project would involve 1,387 acres of PD private lands, 1,935 acres of BLM-administered lands, and 10 acres of State of Arizona lands.

Mining and Ore Processing Operations. Two open pit mines, Dos Pobres and San Juan, will be developed. The Dos Pobres open pit mine is located entirely on PDSI patented lands. Surrounding the planned Dos Pobres pit is an approximately 1,300-foot setback to allow for potential future mining of the deeper sulfide milling reserves that underlie the leachable ore at Dos Pobres. Leach ore and development rock (unmineralized and low-grade material) will be mined using conventional drilling and blasting techniques to reduce ore to a manageable size (called run-of-mine or ROM) for loading and hauling. Depending on its copper content, ROM leach ore will be either hauled directly to the leach pad or hauled to a crushing system. Development rock will be hauled to two unlined development rock stockpiles, identified as East and West development rock stockpiles.

Three distinct periods of mining will occur during the 16-year life of the Project. The first period involves mining leach material exclusively from the Dos Pobres deposit during Years 1 through 4 . During the second period (Years 5 to 13), mining operations at the Dos Pobres and San Juan deposits will be combined. The third period, Years 14 - 16, will consist entirely of mining the remainder of the San Juan deposit. Mining rates and copper cathode production will decline during this period. The peak mining rate is approximately 94,000,000 tons per year and occurs during the first few years fo the Project.

Crushing and Material Handling. The crushing and conveying system is designed to handle 100,000 tpd. The crushing plant will be located along the eastern side of the leach pad, between the Dos Pobres and San Juan pits. The truck loadout facility will be located at the southern end of the crushing and material handling facility. Concentrated sulfuric acid (approximately 92 - 94 percent) will be added to the ore stream as it is transferred from conveyor to the load-out bins to precondition the ore to enhance leach recoveries.

Leach Pad. A single, rectangular, approximately 922-acre leach pad will be located south of the Dos Pobres pit, between Cottonwood Wash on the east and Watson Wash on the west. The leach pad will be developed from south to north in 20 to 25-foot-high lifts. Based on current projected production rates, the leach pad is expected to reach a height of approximately 400 to 450 feet but will be designed to accommodate a potential ultimate height up to 600 feet. The leach pad will be constructed with setback benches to achieve a final overall slope of no greater than two horizontal to one vertical (2H:1V). The top surface of the pad will ultimately slope at approximately the same degree as the existing natural terrain. The site selected for the leach pad offers sufficient slope (generally steeper than four percent) to allow use of the natural contours of the terrain for collection of pregnant leach solution (PLS).

The key elements of the leach pad design include the pad foundation, a composite liner system consisting of a compacted clayey soil underliner and a synthetic geomembrane liner, and overliner material. The leach pad design includes an internal stormwater collection ditch that will divert clean stormwater away from the pad during early years of operation, when the leach pad is confined to the southern portion of the site below the ditch. Later, this ditch will be incorporated into the leach pad system to provide for internal collection of PLS flows during leaching on the northern portion of the pad. The ditch will intercept PLS flows from the northern portion of the leach pad and direct them to the east edge of the pad where they will flow to the leach pad solution collection channel.

Raffinate, an acidic aqueous solution, will be applied to the leach pad using wobblers or drip emitters. As the leach solution percolates through the copper-bearing ore, it will dissolve soluble copper minerals contained in the rock. The copper-laden water, called pregnant leach solution, or PLS, will then exit from the lined leach pad and be routed to the lined excess process solution impoundment located at the southeastern toe of the pad, from where it will be routed directly to the PLS collection tank and eventually processed at the SX/EW plant.

Leach Solution Collection/Distribution Facilities. The leach solution collection/ distribution system includes the excess process solution impoundment, a million-gallon PLS tank, and various piping and conveyance systems. PLS flows greater than that which can be processed by the SX/EW plant are retained in the lined excess process solution impoundment, from which they can be reintroduced into the PLS collection tank as required. Excess flows can also be drawn from excess process solution impoundment into the raffinate tank for return to the leach pad surface.

Solution Extraction and Electrowinning (SX/EW) Processing Facility. The solution extraction (SX) and electrowinning (EW) processing facility will consist of three primary components (SX plant, tank farm, and electrowinning tank house) and is located southwest of the leach pad.

Development Rock Stockpiles. Unmineralized and low grade material (referred to herein as development rock) will be hauled at ROM size to two unlined stockpiles that will not be leached. Development rock stockpiles will occupy approximately 861 acres total. One stockpile will be situated to the west of the Dos Pobres pit (the West development rock stockpile), and the other to the south of the San Juan pit (the East development rock stockpile). Stockpiles will be constructed in 50-foot lifts to approximately 400 feet above ground level. A liner is not proposed for these development rock stockpiles as the material is considered inert because the neutralization capacity of the non-ore material (i.e., development rock) present within the orebody exceeds the rock's acid-generating potential.

Soil and Growth Medium Stockpiles. Twelve soil and growth medium stockpiles covering a total of roughly 123 acres will be created for use as growth media and capping material in reclamation.

Water Supply. The average amount of water required for the Project is forecast at 4,272 gpm. Groundwater near the Dos Pobres and San Juan mines will be developed for use by the Project. Currently, five 1,350 gpm vertical pumps are planned to be established at wells constructed in the project area. Water will be pumped from wells to water storage tanks that will gravity feed to various project facilities.

Electric Power. The power system for the Project will include construction of about seven miles of a primary 230 kilovolt (kV) transmission line from the existing 230 kV Hackberry line to a main substation that will be located on Phelps Dodge's property west of the Lone Star Road. At the main substation, power will be transformed and distributed via three separate 69 kV overhead transmission lines to the mine areas and facilities.

Compactible Soil Borrow Area. The Lone Star Compactible Soil Borrow Source is located on PD's private lands in Sec. 25, T6S, R26E, approximately 4.5 miles southeast of the leach pad. Material from this borrow source will be used to construct the composite liner system for the leach pad and will be transported by truck to the leach pad along an approximately 110-foot-wide aggregate roadway. The borrow area will be approximately 50 acres in size.

Shops, Office, Administration, and Communications. A service complex that includes a heavy duty truck shop, maintenance shop, fire truck and ambulance building, cable repair shop, recycling center, oil and lubricant storage, fuel station, and a truck wash facility will be built south of the San Juan mine. Communications for the Project will include hard wiring of a telephone cable in a loop configuration between the main security gate, Site No. 2, the truck shop complex, and the SX/EW plant. Radio communications require construction of a repeater transmitter tower on a hill located south of the San Juan Mine and three base stations for use at the administration building, mine office, and SX/EW facility.

Transportation/Access/Security. New infrastructure requirements for the Project include upgrading existing access roads, constructing employee parking facilities, and establishing additional security gates. Road crossings and access and haul roads will be constructed with culverts or at grade. A fence will be constructed around the mine facility as needed to provide for security and safety and to keep cattle on adjacent lands off the mine property. Employee parking will be provided at Site No. 2 and the SX/EW plant site.

During the operational phase, average daily traffic is forecasted at 325 employee round trips and 104 truck round trips. Of the approximately 104 truck round trips to and from the Project, about 78 round trips (75 percent) are expected to come from the east and south and use the Solomon Bridge to cross the Gila River. The remaining 25 percent of trucks (26 round trips) are expected to arrive from the west and use the Thatcher Bridge (Reay Lane Bridge) to access the project site in order to minimize potential traffic impacts in town.

Aggregate Materials. Aggregate materials will be used for a variety of purposes, including road base fill material, riprap for stormwater diversion channels and road crossings, aggregate for concrete, and other uses. Two aggregate borrow sources totaling about 146 acres have been identified within the project area, from which approximately 19 million tons of material will be excavated over the life of the Project.

Environmental Protection Measures. A variety of environmental protection measures have been incorporated into the Mining Plan of Operations to meet applicable standards including those of regulatory agencies such as the ADEQ, COE, and EPA that have review and approval authority over the proposed Project. These measures range from integrated stormwater management programs to concurrent and post-

closure reclamation plans. Environmental protection measures that have been incorporated into the mine plan are summarized below.

- **Surface Water Management.** The Project will be constructed and operated as a "zero-discharge" facility, meaning that all process waters and stormwaters that come into contact with process facilities will be contained on-site rather than discharged off-site into waters of the United States. Development of the Project as a zero-discharge facility will necessitate diverting stormwater around the project area to reduce run-on into the pits and ponding against stockpiles, and to prevent release of flows potentially impacted by the leaching or mining operations into surface waters. The stormwater management facilities are designed to ensure that there are no potential points of stormwater discharge from the mines for the 100-year, 24-hour and 100-year, 10-day storm events. The stormwater impoundment will retain all incidental flows (stormwater and leach pad drain-down occurring during a power outage of up to 24-hours in duration) from the leach pad. A series of retention dams located upstream, downstream, and within the footprints of the development rock stockpiles will prevent off-site surface water discharge from storms during the early years of mine development.

  Four diversion channels, South, Peterson Wash, West, and Site No. 1, will be constructed upgradient of the stockpiles and open pits to divert clean stormwater runoff around and through the site, preventing the water from being impacted by mining activities

  An integrated stormwater retention management system will be used to control stormwater run-on and runoff from the leach pad and the West and East development rock stockpiles. The system will use a lined stormwater impoundment below the leach pad, and a series of retention dams below, within, and above the footprints of the development rock stockpiles. These facilities were designed for the worst-case scenario of 100-year/24-hour and 100-year/10-day storm events.

  Stormwater entering the leach pad perimeter will be conveyed to the stormwater impoundment designed to contain the 100-year/24-hour design storm event. The impoundment will be lined with a single, 60-mil, High-Density Polyethylene (HDPE) liner over six inches of 3/8-inch-minus, compacted native or natural material such as screened soil. The impoundment is designed with a storage capacity of approximately 332 acre-feet, a volume of sufficient capacity to handle drain-down from the leach stockpile that would occur if there was a 24-hour power outage at the mine and a 100-year/24-hr storm event. The total surface area of the impoundment footprint is approximately 23 acres.

  Diluent, reagents, fuel, and other petroleum products used in the operations will be stored in above-ground tanks within impervious secondary containment systems to avoid possible discharge to surface waters. All tanks will have leak detection systems. Secondary containment systems will have a capacity of at least 110 percent of the volume of the largest tank contained within the secondary containment facility. Sulfuric acid will be stored in tanks located within containment structures that can be drained to other containment facilities, such as the lined leach pad or the SX/EW tankfarm runoff tank. The SX/EW plant will be designed as a zero-discharge facility, incorporating drainage design features and containment tanks.

- **Groundwater Protection.** Project facilities are subject to the requirements of the State of Arizona's Aquifer Protection Program (APP). Proposed groundwater protection measures include use of a liner system beneath the leach pad, stormwater controls, pumping systems, tank containment systems, and other features and operations designed to meet APP requirements.

PDSI has incorporated processes, structures, and operating methods that meet Best Available Demonstrated Control Technology (BADCT) into facility designs to protect groundwater and to ensure the greatest degree of discharge reduction achievable, including, where practicable, a technology permitting no discharge of pollutants. The facility(s) will be developed in a manner that achieves the greatest degree of demonstrable discharge reduction. The leach pad liner system, lined stormwater impoundment, septic tank systems, truckwash, sulfuric acid storage, and other facilities and operations have been designed to meet BADCT criteria.

A conceptual closure and post-closure strategy for the Project has been developed and will be included in the APP application. ADEQ requires conceptual closure strategies in the APP permit application that minimize stormwater run-on and infiltration and/or seepage from mine facilities that would affect aquifer water quality. In general, all potentially discharging facilities will either be closed in place or will undergo clean closure. Closure in place consists of leaving solid materials in place and, if necessary, providing a containment system that meets Best Available Demonstrated Control Technology (BADCT) requirements. Clean closure consists of removing and properly disposing of all liquid and solid waste, unused or recyclable chemicals, and impacted materials from the facility (including removing underlying impacted soils to appropriate industrial health- or risk-based levels).

- **Waste Management.** Solid waste generated at the Project will be disposed of in a manner consistent with ADEQ regulations. Solid waste will be transported off-site to an approved disposal or recycling facility. Office trash will be disposed of at the local landfill near Safford. Used petroleum products will be transported to a contracted recycling company in accordance with state and federal regulations. Nearly all scrap metal, most used HDPE pipe, and some construction debris will be recycled. Wastes determined to be hazardous under state and federal laws will be properly packaged and transported by a permitted transporter to an EPA-approved hazardous waste treatment, storage, or disposal facility. A pollution prevention plan, as required by the EPA, will be developed by PDSI prior to Project construction in order to minimize waste generation at the Project through source reduction, reuse, and recycling.

- **Hazardous Materials Storage, Handling, and Transport.** Sulfuric acid, diluent, reagents, fuel, and other petroleum products used in the operations will be stored in above ground tanks situated within impervious secondary containment systems having a containment capacity of at least 110 percent of the volume of the largest tank therein. Sulfuric acid will be shipped to the Project in tanker trucks and stored on-site in carbon steel tanks. The SX/EW operations will include two, 10,000-ton (1,250,000 gal) sulfuric acid storage tanks near the secondary crushing plant for raffinate acid addition and one, 2,500-ton (312,000 gal) storage tank at the SX/EW facility to provide make-up acid to the SX plant. All three tanks will be situated in acid-resistant, concrete secondary containment facilities that can be gravity drained to other containment areas, such as the lined leach pad and the one-million gallon stainless steel runoff collection tank located in the tankfarm. Sulfuric acid consumption rates over the life of the Project are estimated to average about 2,500 tpd (about 312,500 gpd) with a peak consumption rate of approximately 3,600 tpd (about 450,000 gpd). These rates will require, on average, approximately 94 truck loads of acid per day, peaking at 133 loads per day during peak consumption periods.

  Reagents used and stored in the SX/EW area include diluent, extractant, and cobalt sulfate. These reagents will be stored in tanks located in the SX/EW tankfarm. The tankfarm is designed as a containment area. Process solution bypasses and stormwater runoff are collected in the tankfarm drainage system, which incorporates the one-million gallon runoff tank located within the tankfarm.

Diesel fuel and gasoline will be supplied to the Project by tanker trucks. The trucks will travel directly to one of three fueling stations and offload into above ground storage tanks that will be provided with secondary containment systems. Storage tanks for this fueling station will be within a bermed area lined with polyvinyl chloride (PVC) or HDPE.

- **Air Quality Control Permit.** The Project will meet all applicable state and federal air quality standards. These standards prescribe emission limits, operational practices and administrative requirements. The purpose of these standards is to ensure that emissions are sufficiently reduced so as to prevent any exceedances of health-based, maximum allowable ambient concentrations.

Closure and Reclamation Measures. In addition to the conceptual closure plan submitted in its APP permit application, PDSI prepared and submitted a reclamation plan to the BLM. This plan was developed to meet both federal and state reclamation requirements. The reclamation measures presented in the plan were intended to achieve productive post-mining land uses (PMLU) as required by both federal and state regulations. Types of PMLUs envisioned for the project area include 1) wildlife habitat and limited grazing; 2) recreation, tourism, and education; 3) industrial development; 4) future mineral exploration and mine development; and 5) management of environmental resources including visual, air, water, and soil.

- **Leach Pad.** At closure, the leach pad will be allowed to drain to remove residual process solutions, consistent with APP requirements. To achieve the PMLU of wildlife habitat and limited grazing, revegetation with native species will occur in discrete patches (microsites) that together will total approximately 20 percent of the surface area of the top of the leach pad. Microsites will be distributed across the leach pad, including areas adjacent to designated ponding areas. A test program will be undertaken concurrently with mine operation to determine the optimum method for reclamation of the leach pad side-slopes and will involve rinsing the surface of the flat area of the setback and outer slope with fresh water to remove residual salts. Following rinsing, the flat area of the setback will be capped with approximately 12 inches of Basin Fill sediment or comparable growth medium and seeded with native species.

- **Development Rock Stockpiles.** To support the wildlife habitat and limited grazing PMLUs planned for the development rock stockpiles, 1) PDSI will construct stormwater diversions and management systems; 2) the top surfaces of the development rock stockpiles will be graded during final placement of material to minimize random ponding and infiltration, to direct stormwater flows to compacted areas within the interior of the surface area for collection and evaporation, and to arrive at the final configuration, and the top portions of slopes will be crown chained or dozed to stabilize slope faces; and 3) revegetation with native species will occur in discrete patches (microsites) that together will total approximately 20 percent of the surface area of the top of the development rock stockpile.

- **Open Pits.** Revegetation of pit areas would interfere with potential future mining opportunities in the Mining District and is therefore not proposed. The open pit areas will be maintained for possible future access to mineral resources. Through time, a pit lake is expected to develop in each of the open pits but water quality within the pit lakes is expected to be satisfactory and specific remedies or reclamation activities are not anticipated to be necessary.

- **Roads and Traffic.** The post-reclamation configuration of roads has been designed to meet the access requirements for future industrial uses, education, and tourism uses, maintenance and security functions, and environmental monitoring. Approximately 160 acres of haul roads (excluding areas within the pits) and approximately 45 acres of new access roads will exist at the project site upon closure. Paved roads will be retained and maintained for long-term site access.

Reclamation Costs and Bonding. The estimated total cost to implement the proposed closure and reclamation measures is $7,978,000 (1997 dollars), which includes $1,311,000 in costs for closure requirements identified for PD's Aquifer Protection Permit and $6,667,000 in costs for reclamation measures. In consultation with BLM and the State Mine Inspector, PD will select an appropriate financial assurance mechanism(s) for reclamation costs. Potential financial assurance mechanisms include any one or a combination of the following: surety bond, certificate of deposit, trust fund with pay-in period, letter of credit, insurance policy, certificate of self-insurance, cash deposit with the state treasurer, evidence of ability to meet a corporate financial test or corporate guarantees per 40 CFR 264.143(f), or annuities.

Projected Employment. The Project will provide both short-term construction employment and long-term employment in the form of direct employment by PDSI, local contractor employment in direct support of project operations, and local indirect employment (jobs created or maintained as a result of direct employee needs for goods and services). For the operational phase of the Project (16 years), approximately 250 full-time employees, with an average annual per-capita salary of $36,000 (1997 dollars) plus benefits, will be employed annually by PDSI. It is expected that roughly 80 percent or more of the positions would be filled by applicants residing in the local Graham and Greenlee counties area, including some PD employees currently working at PD's Morenci Mine. PDSI estimates that local contractors will employ approximately 100 people to provide direct support services for the Project. A portion of these contractors will work onsite at the Project while the remainder will provide certain maintenance and fabrication services out of local shops. Because of the Project's proximity to the San Carlos Apache Reservation, employment opportunities for tribal members will be available through both direct employment and through contractors that may be located on the reservation. Estimated total payrolls for local contractors working at or for the Project range from $2.5 to $3.0 million annually.

Partial Backfill of San Juan Alternative

This action alternative proposes mining, processing, mine support, environmental protection, closure and reclamation, and employment that are identical to those of the Proposed Action with one exception: approximately 60 - 80 million tons of development rock would be backfilled into the mined-out portion of the San Juan pit instead of placed on the West and East development rock stockpiles. As a result, the ultimate heights of both development rock stockpiles would be approximately one lift (about 50 ft) lower than the heights anticipated for the Proposed Action alternative. This alternative would also preclude future potential development of any copper resources remaining in the San Juan pit that are not economic to mine at this time.

No Action Alternative

This alternative involves no federal actions--COE and EPA would not issue their respective Clean Water Act Section 404 and 402 permits and BLM would reject the MPO on the basis of undue and unnecessary degradation of the environment. The result would be no mining on public lands.

Land Exchange Alternatives Set

Land Exchange Alternative

This alternative proposes exchange of approximately 17,000 acres of public lands desired by PDSI for approximately 3,858 acres of private lands that PD owns in five counties in Arizona. In disposing of the selected lands, BLM relinquishes authority for those lands, including oversight of the MPO, reclamation, and post-mining land uses. Under this alternative, the State Mine Inspector's Office would have jurisdiction over

reclamation on the selected lands. The selected and offered lands and their foreseeable uses under the exchange are described below.

Selected Lands and Their Foreseeable Uses. The approximately 17,000 acres of selected lands are located north of Safford on the southern slopes of the Gila Mountains. These lands, which are heavily encumbered by PD-owned lode claims, would be used in the near term for mining, as described under the Proposed Action alternative, including continued use of an office building and other facilities located on the Sanchez parcel for mining support-related activities such as mine process technology research. Other foreseeable uses of the selected lands would include support for potential future development activities for the known Dos Pobres deep sulfide and Lone Star oxide deposits, both of which are located on existing PD lands. Assuming all required permits and clearances are received, these potential projects could be implemented during the latter period of mining at the Dos Pobres/San Juan Project.

The Dos Pobres deep sulfide and Lone Star oxide projects are still conceptual and only general footprints of potential disturbance are available at this time. The potential mining activities and facilities associated with these conceptual plans have been identified by PDSI and categorized into three types of foreseeable uses of the selected lands. The first foreseeable use category, referred to as Production Operations and Support Areas, would include uses such as open pits, leach pad(s), stockpiles, SX/EW processing facilities, support facilities, tailings impoundment, concentrator, and haul roads. This use category for both the Dos Pobres deep sulfide and the Lone Star projects would affect approximately 1,713 acres of the selected lands, 7,523 acres of PD lands, and about 46 acres of State lands. The Transitional foreseeable uses category, in which mine dump runout areas and access roads would be located, would affect 231 acres of BLM land, 884 acres of PD lands, and 29 acres of State lands. The third foreseeable use category, Intermittent uses, would involve use of the lands for spatial, safety, and site security buffers, and would affect 12,921 acres of BLM lands, 18,110 acres of PD lands, and 234 acres of State lands.

Offered Lands and Their Foreseeable Uses. The 11 offered properties are located within special management areas or areas identified by the Safford Field Office as Long-Term Management Areas (LTMA). Offered lands comprise the Amado and Curtis properties located in the Gila Box RNCA; the Musnicki, Freeland, and Butler-Borg properties located in the Dos Cabezas Mountains LTMA; the Schock, Feulner, Clyne I and Clyne II properties in the Empire-Cienega LTMA; the Norton property in the Southwest Gila Valley LTMA; and the Tavasci Marsh property in the congressionally designated boundary of the Tuzigoot National Monument. The foreseeable uses of these 11 offered properties with regard to public lands uses such as grazing, mineral entry, and recreation, would be consistent with the management decisions approved in applicable federal management or activity plan. These include the Final Gila Box Management Plan for the Amado and most of the Curtis property; the Safford District RMP, as amended, for the remainder of the Curtis property, Norton, Musnicki, Freeland, and Butler-Borg properties; the Interim Management Guidance for the Empire-Cienega Resource Conservation Area and Phoenix District RMP for the Schock, Feulner, Clyne I and II properties; and the Tuzigoot Statement for Management for the Tavasci Marsh property.

No Land Exchange Alternative

This alternative involves no land exchange, which would result in BLM retaining the selected lands under public management and PD retaining ownership and management of the 11 offered properties. This alternative would require the BLM to make a decision under the Mine Plan Alternatives Set regarding the MPO submitted by PD and if an action alternative is selected, oversee implementation of the MPO and reclamation on BLM lands. Impacts of this alternative include direct and indirect realty-related impacts of the exchange itself and the foreseeable uses of the selected lands would result in the mining impacts described under the Proposed Action as well as impacts anticipated to result from the future potential Dos Pobres sulfide and Lone Star projects.

SCOPING ISSUES

Two scoping efforts were made for this Project; an initial scoping took place in December 1994 and a second scoping occurred in October 1996 after PDSI submitted their MPO. The summary of the scoping issues analyzed in this EIS as determined by the Interdisciplinary Team for this EIS is presented in Table S-1 below; see also Table 1-4 in the body of the document.

IMPACTS

Table 2-14 in the body of the document (Volume 1) presents a comparative summary of the direct, indirect, and cumulative impacts of the all the alternatives evaluated in this EIS. The basis for this summary is the environmental analysis provided in Chapter 4 of the EIS.

Table S-1. Summary of Scoping Issues Analyzed in the Dos Pobres/San Juan Project EIS

- Land Use
  - Public Lands Management
  - Access and Recreation
  - Encumbrances
  - Agriculture and Grazing
  - Mineral Rights
  - Surface Water Rights
  - Noise and Vibrations
  - Visual Resources
  - Hazardous Materials
- Physical Resources
  - Climate
  - Air Quality
  - Geology
  - Soil
  - Groundwater Quality/Quantity
  - Surface Water Quality/Quantity, including Waters of the U.S.
- Biological Resources
  - Vegetation
  - Wildlife Resources
  - Special Interest Species/Critical Habitat
  - Biodiversity
- Cultural Resources
  - Archaeological Resources
  - Traditional Cultural Properties
- Socioeconomic Resources
  - Population and Demographics
  - Local and Regional Economy
  - Infrastructure
  - Transportation
- Indian Trust Resources
  - Indian Trust Assets

Volume 1

Chapter 1: Purpose and Need

CHAPTER 1

PURPOSE AND NEED

1.1 INTRODUCTION

The Proposed Action analyzed in this Environmental Impact Statement (EIS) is the Dos Pobres/San Juan Project, as described in a Mining Plan of Operations (MPO) submitted to the Safford Field Office of the Bureau of Land Management (BLM), by Phelps Dodge Safford, Inc. (PDSI)[1]. As proposed in the MPO, the Dos Pobres/San Juan Project (Project), located near Safford, Arizona, would consist of two open pit copper mines with one leach pad, one shared solution extraction/electrowinning (SX/EW) processing facility, and shared infrastructure and support facilities. As an alternative to approval of the MPO, the BLM is considering a land exchange alternative with Phelps Dodge (PD) that would enable the Dos Pobres/San Juan Project to proceed without BLM oversight, assuming that PDSI is able to obtain all necessary environmental permits. Authorizing the MPO or approving the land exchange constitutes two separate but related federal actions, both of which are addressed in this single EIS per the National Environmental Policy Act (NEPA) of 1969. To keep the distinction between the two actions clear, the alternatives presented and analyzed in this document have been grouped into two sets: a Mining Plan Alternatives Set (including the MPO, which is the Proposed Action) and a Land Exchange Alternatives Set. Each set includes a "No Action" alternative pertinent to the decision(s) to be made by the agencies cooperating on this EIS. All the alternatives, with the exception of the No Action alternative under the Mining Plan Alternatives Set, would result in development of the Dos Pobres/San Juan Project within the constraints of federal and state environmental permitting requirements.

Both a proposed MPO and a proposed land exchange involving public lands are subject to review under NEPA. The BLM, as the primary decision-making agency for these actions, has determined that an EIS is required and is serving as the lead agency responsible for preparation of the EIS. Cooperating agencies include the U.S. Army Corps of Engineers (COE) and the Environmental Protection Agency (EPA), both of which have permitting responsibilities under the Clean Water Act for the proposed mining operations. The Bureau of Indian Affairs (BIA), as a trustee for natural resources of the San Carlos Apache Tribe and the Gila River Indian Community, is also a cooperating agency and is providing special expertise in issues involving cultural resources and Indian Trust Resources. Resource specialists from these four agencies make up the Interdisciplinary Team (ID Team), the group responsible for the preparation of this EIS.

1.2 DOCUMENT ORGANIZATION

This Draft Environmental Impact Statement (DEIS) follows the basic format guidelines provided by the Council on Environmental Quality (CEQ) at Section 1502 of Title 40 of the Code of Federal Regulations (40 CFR 1502). The DEIS is presented in two volumes to facilitate simultaneous review of text and figures. Volume 1 includes six chapters and front and back matter; Volume 2 includes figures and appendices. The Table of Contents identifies the key sections and subsections within each of the six chapters. A brief summary of the content of each chapter is provided below.

[1] Phelps Dodge Safford, Inc. is a wholly-owned subsidiary of Phelps Dodge Corporation. In this document, the abbreviation "PDSI" refers to Phelps Dodge Safford, Inc.; "PD" refers to the parent corporation and its subsidiary operations held under the mining division named Phelps Dodge Mining Company.

Chapter 1, "Purpose and Need," summarizes the Project's history, identifies the Project's purpose and need, describes the decisions to be made by the lead and cooperating agencies, provides the regulatory framework that guides those decisions, summarizes the issues raised during public and agency scoping efforts, and provides a matrix for tracking scoping issues analyzed in this EIS.

Chapter 2, "Alternatives," describes the processes used by the ID Team to formulate alternatives, describes the two sets of alternatives that are analyzed in detail (i.e., the mine plan alternatives set and land exchange alternatives set, both of which include a No Action alternative); identifies alternatives considered but *not* analyzed in detail; and provides a comparative summary of the environmental impacts of the alternatives analyzed.

Chapter 3, "Affected Environment," describes the existing environmental resources potentially affected by the Project, specifically those resources identified during scoping. It discusses the resources involved in both the MPO and the land exchange alternatives. This section describes the baseline conditions for determining the potential effects of the alternatives.

Chapter 4, "Environmental Consequences," analyzes the direct, indirect, and cumulative impacts of the Proposed Action and its alternatives on the existing environment. This chapter provides the analyses for the summary table of impacts provided in Chapter 2.

Chapter 5, "Consultation and Coordination," summarizes the efforts of the agencies to inform the public, including federal, state, and local agencies, and to involve them in the analysis of the Project's impacts. Also included in this chapter is a summary determination of whether the environmental analysis for the Project has complied with Executive Order 12898 regarding Environmental Justice.

Chapter 6, " List of Preparers," identifies those persons primarily responsible for contributing to the preparation of this EIS and lists their qualifications.

1.3 PROJECT HISTORY AND BACKGROUND

The Dos Pobres/San Juan Project is located in the Safford Mining District in Graham County, Arizona, about seven to eight miles north of the city of Safford (Figure 1-1). The Safford Mining District consists of four known, undeveloped porphyry copper deposits (Dos Pobres, San Juan, Lone Star, and Sanchez) located along the southwestern slope of the Gila Mountains north of the Gila River. Most of these deposits (also referred to as "orebodies") are located on land owned by PD, but some extend onto public lands administered by the BLM. The portions of the deposits on BLM land are controlled by PD through mining claims filed under the auspices of the General Mining Law of 1872.

In 1994, in an effort to consolidate their surface and mineral holdings in the Safford Mining District, PD proposed a land exchange with the BLM and both parties later signed an Agreement to Initiate (ATI) formal consideration of the land exchange. Through the proposed exchange, PD would acquire public lands (referred to as the selected lands) within and adjacent to its existing private property in the Mining District in exchange for other lands (the offered lands) in Arizona currently owned by PD. Figure 1-2 shows the selected lands and the project area[2] in relation to the general layout of the mine plan.

[2] Throughout this document, the term "project area" refers to both the public lands selected for the proposed land exchange as well as the public and private lands potentially impacted by the MPO.

The BLM determined that, before making a decision about the land exchange, they would have to prepare an EIS to comply with provisions of NEPA. Initial public scoping to identify issues to be analyzed in the Safford Land Exchange EIS took place in late fall of 1994. During the scoping process for the proposed land exchange, two separate events occurred. First, PD was made aware that the COE would likely require an additional EIS as part of COE's public interest review of the Section 404 Permit required to implement the foreseeable mining uses if the land exchange was authorized. Second, PD's corporate planning and development schedules for the Dos Pobres/San Juan Project were accelerated. Therefore, PD opted to pursue development of portions of the selected lands for mining through authorization of an MPO. This route entailed requesting approval (via an MPO) from the BLM to develop the Dos Pobre/San Juan Project on public lands pursuant to the General Mining Law of 1872 and surface management regulations at 43 CFR 3809. In May of 1996, PD submitted to the BLM the *Dos Pobres/San Juan Project Plan of Operations* (an MPO). Subsequently, PD established Phelps Dodge Safford, Inc. (PDSI) as a wholly-owned subsidiary to be the operating entity to oversee the Project. In December 1996, PDSI submitted a revised MPO to the BLM, which has since been updated with several minor revisions as ongoing mine planning studies have been completed (PDSI 1998c).

In response to PDSI's submittal of an MPO, the BLM 1) determined that the EIS should reflect the fact that an MPO is now the Proposed Action; 2) made the land exchange proposal one alternative to the MPO; and 3) invited the COE and the EPA, which are responsible for the Clean Water Act (CWA) permitting requirements of the MPO, to participate in the EIS process as cooperating agencies. The EIS was renamed the *Dos Pobres/San Juan Project Environmental Impact Statement*.

BLM then reinitiated the scoping process because submittal of the MPO was a significant change in scope from the original land exchange proposal. Public scoping efforts for the Project are summarized in Section 1.6 of this chapter and are described in more detail in Chapter 5. In December 1997, BIA became a cooperating agency in the preparation of this EIS and is contributing its special expertise in cultural resources and Indian Trust Resources.

1.4 PURPOSE OF AND NEED FOR ACTION

Phelps Dodge (PD) currently owns approximately 20,000 acres of land north of Safford, Arizona, containing all of the Dos Pobres copper deposit and portions of the nearby San Juan deposit. Additionally, PD holds existing lode mining claims to the remainder of the San Juan deposit, which is on adjacent BLM-managed federal lands, and to federal lands surrounding both deposits. The proximity of these ore bodies to one another and to the nearby Lone Star and Sanchez deposits, where PD also owns property or has existing mining claims, provides PD with an opportunity to combine certain elements of mine infrastructure. Phelps Dodge has submitted a mining plan of operations (MPO) to BLM to develop both the Dos Pobres and San Juan ore bodies. This proposed action is consistent with the 1872 General Mining Law, as amended, and BLM's Surface Management Regulations at 43 CFR 3809.

The purpose and need for the Proposed Action (the Dos Pobres/San Juan Project) is to develop the mineral resources associated with the Dos Pobres and San Juan leachable copper ore deposits as an integrated project using conventional open pit mining and solution extraction/electrowinning (SX/EW) technologies to meet a continuing demand for copper.

As an alternative to developing the proposed Project on BLM-managed lands, the BLM and Phelps Dodge have agreed to consider a land exchange. Although the primary purpose and need for the land exchange alternative is to exchange public for private lands to achieve improved management of federal lands and federal acquisition of lands containing important resource values, the exchange alternative is also consistent

with the purpose and need for the Proposed Action. The land exchange would still allow development of the Dos Pobres and San Juan ore deposits should Phelps Dodge obtain the required federal and state permits to do so. Under either an MPO or a land exchange scenario, the Dos Pobres/San Juan Project must be permitted by the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act, U.S. Environmental Protection Agency (EPA) under Section 402 (National Pollutant Discharge Elimination System) of the Clean Water Act, and Arizona Department of Environmental Quality (ADEQ) under Arizona Revised Statutes (ARS) 49-241 and 49-408 (Aquifer Protection Permit and Air Quality Permit) prior to implementing proposed mining operations. Both the proposed action alternative and the land exchange alternative are in conformance with the Safford District Resource Management Plan, as adopted in the Partial Record of Decision I (BLM 1992) and the Partial Record of Decision II (BLM 1994).

The land exchange alternative has been identified as the BLM's preferred alternative and is consistent with the land exchange provisions of the Federal Land Policy and Management Act (FLPMA), as amended by the Federal Land Exchange Facilitation Act (FLEFA) and regulations governing land exchanges at 43 CFR 2200.

1.4.1 Decisions to be Made

Three of the four agencies cooperating on the preparation of this EIS will make decisions based upon the environmental analyses documented herein and in the Final EIS. The BLM will issue a Record of Decision (ROD) regarding the land exchange or the MPO and the federal permitting agencies, the COE and EPA, will make their respective permit decisions; BIA has no permitting jurisdiction over the Project and therefore has no decision to make. The decisions to be made by the BLM, COE, and EPA are summarized below.

The BLM's authorizing official must:

- approve the land exchange alternative; *or*
- approve the proposed MPO; *or*
- in the event that analysis shows that the proposed MPO would cause unnecessary or undue degradation of the environment, select a mining plan alternative that would not cause such degradation; *or*
- select the No Action alternative if analysis shows that unnecessary or undue degradation of the environment would occur from the proposed MPO and any other mining plan alternative under consideration.

The BLM manages the public lands that would be affected by both the proposed mining activity and the proposed land exchange. As such, the BLM has regulatory oversight responsibilities under 43 CFR 3809 and could select one of the mining plan alternatives or, if it determines that both mine plan alternatives would result in unnecessary or undue degradation of the environment,[3] select the No Action alternative under the Mining Plan Alternatives Set. On the other hand, if the BLM decides to trade the selected land into private ownership by choosing to authorize the land exchange alternative, it would relinquish its regulatory oversight responsibilities for those lands and, consequently, its involvement with the Dos Pobres/San Juan Project and the choice of mine plan alternatives (see Figure 1-3).

[3] Unnecessary or undue degradation means surface disturbance greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations on other resources and land uses, including those resources and uses outside the area of operations [43 CFR § 3809.0-5(k)].

The COE's authorizing official must:

- issue PDSI an individual CWA Section 404 permit for the discharge of dredged or fill material into waters of the United States based upon a mine plan alternative in this EIS; *or*
- select the No Action alternative and deny the permit.

The EPA's authorizing official must:

- issue or deny PDSI an NPDES permit for a mine plan alternative; *or*
- select the No Action alternative and deny the permit.

As neither the COE nor the EPA has jurisdiction over the exchange of public lands, their authority extends only to the environmental impacts of the proposed mining operations, and their respective permitting responsibilities are the same whether the proposed mining operations take place on public land or on private land. Both the COE and the EPA are responsible for issuing permits under the Clean Water Act (the COE under Section 404 of the Act and the EPA under Section 402). The COE and the EPA will select one of the mine plan alternatives on which to issue their respective permits or will select the No Action (no permit) alternative under the Mining Plan Alternatives Set. Figure 1-3 graphically depicts the various federal agency decisions that are to be made in this process and the outcomes that would result from the respective decisions made by BLM, COE, and EPA.

1.5 REGULATORY FRAMEWORK AND AUTHORIZING ACTIONS

The proposed Project and its alternatives must conform with numerous federal, state, and local laws and regulations. The major federal laws and regulations that provide the BLM, COE, and EPA with the ability to authorize various aspects of the Project, including a land exchange alternative, are briefly discussed below.

1.5.1 Mining Plan of Operations

As part of its mission to manage multiple resources on public lands, the Department of the Interior (through the BLM) maintains a policy, as decreed by Congress, to encourage the development of federal mineral resources and reclamation of public lands. By submitting an MPO to the BLM, PDSI has invoked plan approval procedures found at 43 CFR 3809.1-6 and within the Safford District's Resource Management Plan (RMP) as amended (BLM 1991, 1994b). Under these procedures and as required by NEPA, the BLM is required to analyze the proposed MPO to ensure that:

- adequate provisions are included in the mine plan to prevent undue and unnecessary degradation[4] of federal lands as a result of authorized mining activities;
- measures are included to provide for reclamation of disturbed land; and
- proposed operations would comply with other applicable federal and state laws and regulations.

[4] As defined at 43 CFR § 3809.0-5; see Footnote 3.

Under the provisions of the General Mining Law of 1872; the Federal Land Policy and Management Act (FLPMA) of 1976; the Mining and Mineral Policy Act of 1970; and the National Materials and Minerals Policy, Research, and Development Act of 1980; PDSI has the right to operate a mine on public lands under an approved MPO, assuming all necessary environmental permits and authorizations are received. Table 1-1 summarizes permits and authorizations necessary to implement the proposed mining and/or the land exchange.

Included among the permits that PDSI must obtain to begin mining activities are two federally issued permits required by provisions of the Clean Water Act (CWA). The first of these, a Section 404 permit, is issued by the COE to control the discharge of dredged and/or fill material into waters of the United States (WUS),[5] including adjacent wetlands. Typical mining and mining-support activities that would require a Section 404 permit include constructing stormwater management facilities and road crossings over drainages, stockpiling leach ore and development rock in WUS, and engaging in any other activity that results in a discharge of dredged and/or fill material into a water of the United States (33 CFR 323). Through issuance of this federal permit, the COE has regulatory jurisdiction over aspects of the proposed Project, regardless of whether it is implemented on public lands or on private lands.

The second CWA permit required for this Project is a National Pollutant Discharge Elimination System (NPDES) permit issued by the EPA under Section 402 of the CWA for point source and general stormwater discharges into waters of the United States. EPA distinguishes between three types of discharges which must be regulated: process wastewaters; mine drainage; and stormwater. Process waters are prohibited from being discharged and include leach pad runoff or seepage and pregnant leach solutions. Mine drainage is any water drained, pumped, or siphoned from a mine; such drainage must meet nationwide, technology-based effluent limitations for numerous specific pollutants. Stormwater discharges include runoff from 1) some kinds of access roads; 2) dikes not constructed of development rock; and 3) certain ancillary structures or reclaimed areas. The COE and the EPA have assumed cooperating agency roles in this EIS process because of their respective permitting authority over these aspects of the proposed Project.

PDSI must also obtain a Class II air quality control permit from the Arizona Department of Environmental Quality (ADEQ). The State of Arizona issues such permits as part of its federally mandated Clean Air Act Title V program to meet National Ambient Air Quality Standards (NAAQS). A Class II permit is necessary for new and modified sources of air pollutants as defined in the Arizona Administrative Code (A.C.R18-2-302[B]).

EPA has delegated to the State of Arizona's Department of Environmental Quality (ADEQ) oversight for groundwater protection and ADEQ has determined that potentially discharging facilities proposed for the Dos Pobres/San Juan Project are subject to environmental review under the Aquifer Protection Permit (APP) program. The APP permit will establish discharge limits to avoid and minimize the potential for exceedances of drinking water quality standards. PDSI expects to submit its APP permit application upon publication of this Draft EIS (J. Korolsky, PDSI, pers. comm.).

Finally, FLPMA Section 302(a), BLM NEPA procedures, and federal Resource Management Planning regulations (43 CFR 1610) require that the proposed action conform with decisions in the applicable RMP(s). BLM has determined that the proposed MPO is in conformance with the applicable decisions in the Safford District RMP, as amended (BLM 1991, 1994b).

[5] "The Clean Water Act defines this as surface waters, including streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, and other ephemeral watercourses and wetlands" (COE 1993).

Table 1-1. Federal and State Regulatory Requirements Applicable to the Dos Pobres/San Juan Project and Alternatives

LAWS/REGULATIONS	REGULATES	APPLIES TO MPO*	APPLIES TO Land Exchange**
FEDERAL			
General Mining Law of 1872; 17 Stat. 94	federal minerals	✔	--
Mining and Mineral Policy Act (1970); 30 USC 21a	federal minerals	✔	--
Nat'l Materials & Mineral Policy, Research, & Development Act (1980) 30 USC §1601-1605	federal minerals	✔	--
Federal Land Policy & Management Act (FLPMA) of 1976; 43 USC §1701 (as amended by FLEFA)	management of federal lands	✔	✔
National Environmental Policy Act (NEPA) (1969) 42 USC § §4321 *et seq.*, as amended	federal undertakings	✔	✔
Federal Land Exchange Facilitation Act (FLEFA); 43 USC §1716, §1740	federal land exchanges	--	✔
American Indian Religious Freedom Act (AIRFA); 42 USC § §1996	Native American religious places and access	✔	✔
Native Am. Graves Protection & Repatriation Act (NAGPRA); 25 USC § §3001 *et seq.*	treatment of human remains and affiliated cultural items	✔	✔
Archaeological Resources Protection Act (ARPA); 16 USC § §470	archaeological resources	✔	✔
National Historic Preservation Act (NHPA); 16 USC § §470 *et seq.*	historic properties incl. traditional cultural properties	✔	✔
Clean Air Act (CAA); 42 USC § §7401 *et seq.*	air quality	✔	✔
Safe Drinking Water Act (SDWA); 42 USC §300f *et seq.*	drinking water quality	✔	✔
Clean Water Act (CWA); 33 USC §1344 *et seq.*	surface water quality	✔	✔
Endangered Species Act (ESA); 16 USC § §1531 *et seq.*, as amended	threatened & endangered species	✔	✔
Resource Conservation and Recovery Act (RCRA); 42 USC §6901 *et seq.*	hazardous or solid waste	✔	✔
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) ; 42 USC §9615	hazardous or solid waste	✔	✔
Emergency Planning & Community Right-to-Know Act (EPCRA) of 1986 42 USC §11005	hazardous or toxic materials	✔	✔
Pollution Prevention Act of 1990	hazardous or toxic materials	✔	✔
Executive Order 11988	floodplain management	✔	✔
Executive Order 12898	environmental justice	✔	✔
Executive Order 11990	wetlands	✔	✔
STATE AND LOCAL			
Environmental Quality Act (EQA) - Aquifer Protection Permit ARS 49-241-251	aquifer water quality	✔	✔
Section 401 State Water Quality Certification	surface water quality	✔	✔
Comprehensive Air Quality Act - Air Quality Permit; ARS 49-408	air quality	✔	✔
Arizona Mined Lands Reclamation Act; ARS 27-901-1026	mining reclamation	--	✔
Well Permits; ARS 45-592	wells	✔	✔
Dam Safety Permit; ARS 45-1203	construction of stormwater management facilities	✔	✔
Arizona Native Plant Law; ARS 03-903	Arizona native plants	✔	✔
Graham County Lighting Ordinance	outdoor lighting	✔	✔
Graham County Septic Permit	septic/waste disposal	✔	--

* Mining on Public Lands; **w/Mining on Private Lands

1.5.2 Land Exchange

The land exchange alternative in this EIS conforms with all applicable federal management plans. The selected lands have been identified for disposal in the Safford District RMP, as amended (BLM 1991, 1994b). All of the offered lands have been identified for acquisition in federal management plans. Table 1-2 lists the federal management plans or area-specific plans that would apply to management of the offered properties if acquired through the exchange. More detailed information about these properties and the proposed and foreseeable uses of them based on these management plans is provided in Chapter 2 in Sections 2.2.2.1.3.

Table 1-2. Federal Land Use, Management, or Activity Plans Applicable to the Offered Lands if Acquired by the Public

Applicable Management Plan	Offered Lands
Safford District RMP, as amended	Musnicki, Freeland, Butler-Borg, Norton
Gila Box RNCA Interdisciplinary Activity Plan	Amado, Curtis
Empire-Cienega Ranches Interim Management Guidance	Feulner, Davison, Schock, Clyne I, Clyne II
Statement for Management, Tuzigoot National Monument	Tavasci Marsh
San Pedro River Riparian Management Plan	Lehner Ranch
Lower Gila Resource Area Management Framework Plan	Lincoln Ranch

Before authorizing an exchange, the BLM must comply with NEPA, Federal Land Policy Management Act (FLPMA) of 1976 as amended by the Federal Land Exchange Facilitation Act (FLEFA) of 1988, and other federal regulations, and must coordinate with other federal, state, and local agencies whose responsibilities may include some aspects of the foreseeable uses of the selected lands. Refer to Table 1-1 for a list of the federal and state laws and regulations that apply to a federal land exchange.

1.5.3 Water Rights Authority

This section identifies the regulatory authority govering water use of the Gila River and the relationship of decisions to be made by BLM, COE, and EPA with regard to that regulatory authority. Water rights concerns in the Gila River basin have been controversial, under litigation, and subject to attempted legislative solutions for decades. These controversies are likely to continue into the foreseeable future.

The Gila River is an intermittent stream that is over-appropriated. The available scientific evidence indicates that the proposed Dos Pobres/San Juan Project will, among other things, reduce existing flows in the Gila River by up to 75.4 acre-feet/year (af/yr). Impacts to the river are predicted as a result of retention of surface water runoff for stormwater management (40 af/yr) and groundwater pumping (35.4 af/yr). Wells proposed for use by the mining operation are located in the project area approximately seven miles north of the Gila River.

Proposed mitigation measures to compensate for these postulated mining-related impacts to the Gila River are to allow farmland with decreed water rights owned by Phelps Dodge, Inc. to go unused on an alternate year schedule, thus decreasing demand on surface flow in the Gila River by an amount equal to or greater than 75.4 af/yr. Alternate year fallowing of these fields will not affect their associated decreed water rights, thus mitigation may be continued in perpetuity.

The 1935 Decree entered in the case entitled *The United States v. The Gila Valley Irrigation District, et al.*, (D. Arizona 1935), commonly called the *Globe Equity No. 59 Decree*, established the rights of the United States and other claimants to use water from the Gila River. Except for certain entities identified in the Globe Equity No. 59 Decree, the rights to use water from the Gila River were authorized for decreed lands solely for irrigation purposes. The beneficial owners of the rights decreed to the United States were the San Carlos Apache Tribe and the Gila River Indian Community. Phelps Dodge Inc. was not decreed rights to use water from the Gila River under the *Globe Equity No. 59 Decree*.

Article XIII of the *Globe Equity No. 59 Decree* prohibits all parties holding decreed rights from diverting, taking, or interfering with the use and enjoyment of other holders of decreed water rights to the Gila River. Subsequent to the entry of the *Globe Equity No. 59 Decree*, PD has acquired land with decreed water rights to use water from the Gila River for agricultural purposes. Article XI of the *Globe Equity No. 59 Decree* forbids a decreed water right holder from changing the point of diversion or the use of the decreed water right unless such change will not injure the rights of other holders of decreed water rights.

Under the present administration of the *Globe Equity No. 59 Decree*, leaving agricultural lands fallow results in permitting other decreed water rights holders, including the Gila River Indian Community and the San Carlos Apache Tribe, to use additional Gila River water, not in excess of their decreed rights, under the existing priority schedule. Thus, depending on river flow and the relative seniority of downstream water right holders, leaving decreed agricultural lands fallow may or may not increase the amount of water in the Gila River leaving the Safford Valley and may or may not create surplus water in excess of the water rights decreed to other users of Gila River water in the Safford Valley.

Due to the restrictions in the *Globe Equity No. 59 Decree* discussed above, it is uncertain whether leaving decreed agricultural lands fallow will authorize Phelps Dodge Inc. to reduce flows in the Gila River by using water that would otherwise flow in the Gila River, absent permission by the Gila River Water Commissioner or ultimately the United States District Court, having continuing jurisdiction over the *Globe Equity No. 59 Decree*.

Therefore, Phelps Dodge Inc. is constrained by Article XIII of the *Globe Equity No. 59 Decree* from implementing portions of the proposed mining operation, construction of the proposed stormwater management system, or initiation of groundwater pumping until it is assured that the proposed mitigation plan will be effective in resolving the complex legal questions regarding the proposed mining operation's impact on water rights under consideration in the ongoing adjudication. Accordingly, it is incumbent on Phelps Dodge Inc. to obtain approval from the Gila Valley Water Commissioner, and from the United States District Court, that the proposed mitigation plan of changes in point of diversion and changes in the use of that water from agricultural to mining use is permissible under the *Globe Equity No. 59 Decree* before they implement mining activities in the Proposed Action alternative that are postulated to affect flows in the Gila River.

Water rights matters in the Upper Gila Basin are presently subject to litigation in state and federal courts and jurisdictional boundaries are unclear. During the litigation process, the legal relationship of groundwater and surface water in the Gila River basin, including the project area, will be defined. The United States will then use this definition to uphold federal trust responsibilities as they relate to federal (Indian) water rights.

Finally, while the BLM has the authority to approve mining-related uses of the public lands and the exchange of public and private lands that are under consideration in this environmental impacts statement, BLM does not have the authority to grant water rights or approve water use for the proposed mining operation. BLM will not take final action until it is determined whether and to what extent such action might be precluded by the Globe Equity Decree. Thus, BLM's approval of either a mining plan of operations alternative or a land exchange alternative cannot be considered as final approval for Phelps Dodge to use the volume of water

from sources specified in this EIS. Prior to implementing aspects of the mining operation predicted to impact surface flow in the Gila River, Phelps Dodge Inc. will be required to conform to federal and state water rights law as defined through litigation associated with the ongoing Gila River adjudication. Phelps Dodge Inc. assumes the risk that its proposed water uses may result in Phelps Dodge Inc. being drawn into water quantity litigation, even by the United States government.

1.6 ISSUES RAISED DURING SCOPING

1.6.1 Scoping Process and Efforts

The BLM conducted two public scoping efforts for the Project. An initial scoping period ("Scoping I") was held in late fall of 1994 when the Proposed Action was solely a land exchange, and a second scoping effort ("Scoping II") was held in October 1996 after PD submitted an MPO (refer to Chapter 5, Coordination and Consultation, for a detailed description of the BLM's public and agency scoping efforts). In Scoping I, a total of 133 letters were received, in which 383 comments were identified and categorized. During Scoping II, a total of 77 letters were received, in which 233 comments were identified and categorized. Letters were received from private citizens and businesses; federal, state, and local agencies; Indian tribes or their representatives; non-governmental organizations and special-interest groups; and elected officials.

1.6.2 Summary of Scoping Issues

For the purpose of determining the scope of analysis for this EIS all issues raised during scoping were grouped into major categories and subcategories as listed in Table 1-3 . o ease tracking of issues in this EIS, Chapter 3 and the majority of Chapter 4 in this document are organized according to this categorization of issues.

Table 1-3. Summary of Scoping Issues Organized by Major Categories (in bold) and Subcategories

LAND USE
- Public Lands Management
- Access/Recreation
- Encumbrances
- Agriculture/Grazing
- Mineral Rights
- Surface Water Rights
- Noise/Vibration
- Visual Resources
- Hazardous Materials
- Foreseeable Uses

PHYSICAL RESOURCES
- Climate
- Air Quality
- Geology
- Soils
- Groundwater
- Surface Water (including Waters of the U.S.)

BIOLOGICAL RESOURCES
- Vegetation
- Wildlife
- Special Interest Species
- Biodiversity

CULTURAL RESOURCES
- Archaeological Resources
- Traditional Cultural Properties

SOCIOECONOMIC RESOURCES
- Population/Demographics
- Local/Regional Economy
- Infrastructure
- Transportation
- Quality of Life

INDIAN TRUST RESOURCES
- Indian Trust Assets

REALTY PROCESS
- Public Interest
- Appraisal Methods

REGULATORY/PERMITTING
- Environmental Protection Laws
- Operations Management
- Mining Plan of Operations

CONSULTATION AND COORDINATION
- NEPA Procedural Compliance
- Environmental Justice

Table 1-4 summarizes the issues and comments that are within the scope and analyzed in this EIS and assists the reader in tracking the analysis of issues which are addressed within the scope of this EIS. Other sources for tracking issues include the Table of Contents and the Index. Whenever possible, comments listed in Table 1-4 were rephrased into neutral questions, but some are direct quotes from commentors. Section 1.6.2.2 lists the scoping issues that the ID Team has determined to be beyond the scope of analysis for this EIS and will not be considered further. Section 1.6.2.3 responds to other scoping issues or comments that are essentially requests for more information; these are also issues that will not be analyzed in this EIS.

1.6.2.1 Issues Beyond the Scope of this EIS

The ID Team determined that the following comments/issues are beyond the scope of analysis for this EIS; these issues will not be further analyzed in this document.

1.6.2.1.1 Socioeconomic Resources

- The effects of the Project on the nation's trade imbalance and importation of copper
- The effects of the Project on the American standard of living

1.6.2.1.2 Regulatory/Permitting

- The relative environmental impacts of mining copper in the U.S. or abroad based on domestic vs. foreign environmental standards and regulations
- Whether the "Preferred Alternative [interpreted to mean the MPO] maximizes PD's efficiency and productivity"

1.6.2.2 Issues Addressed but Not Tracked in this EIS

The following section presents scoping comments (in italics) that the ID Team determined to be pertinent to the EIS but will not be tracked through the EIS. In general, these comments are mainly requests for information or questions about the NEPA or realty processes, and BLM determined that these comments warranted responses rather than analysis within this EIS. The ID Team's responses to these comments are organized by the major resource categories and subcategories as presented in Table 1-3.

1.6.2.2.1 Land Use

Why doesn't the BLM buy the offered lands using the Land and Water Conservation Fund?
This alternative method of acquiring the offered lands has not been pursued for the following reasons: 1) BLM policy, as expressed in Instruction Memorandum No. 96-04 (BLM 1995a) and in the Safford District RMP, as amended, reaffirms previous BLM policy statements that identify land exchanges as the preferred method of disposing of unwanted federal lands and acquiring desirable private lands; 2) purchasing the offered lands using the Land and Water Conservation Fund (LWCF) would require the BLM to embark on a lengthy, uncertain, and competitive process to acquire the necessary funds; and 3) even if BLM's proposal to acquire these lands was selected in the national selection process, Congress could decide not to authorize the needed funds. Therefore, BLM is not pursuing this avenue as a way to acquire the offered lands.

Table 1-4. Scoping Issues Analyzed for the Proposed Dos Pobres/San Juan Project and Sections in this EIS Where Each Issue Is

MAJOR CATEGORY	SUBCATEGORY	COMMENT	DISCUSSED IN SECTIONS
Land Use	Public Lands Management	• What are the impacts to federal management of public lands?	3.2.1.1; 4.3.1.1; 4.4.1.1
		• Would the proposed exchange result in isolating state land and/or non-PD private tracts?	3.2.1.1.1; 4.3.1.2; 4.4.1.2
		• What are the impacts of the exchange on designated special management areas (i.e., Wilderness, Wild & Scenic Rivers, ACECs, NCAs)?	3.2.1.1.2; 4.3.1.1; 4.4.1.1
		• What are the impacts from loss of BLM authority over mining activities if the lands are exchanged?	1.6.2.2.4; 3.2.1.1; 4.4.1.1
		• Would surface water rights be exchanged?	2.2.2; 3.2.1.6; 4.4.1.6.1
	Access/Recreation	• How would public access and recreation use (hunting, rockhounding, hikers, outfitters, etc.) of public lands be affected?	3.2.1.2; 4.3.1.2; 4.4.1.2
		• How would public access on San Juan Mine Road to the Gila Mountains and to the Melody Claims be impacted?	3.2.1.2; 4.3.1.2; 4.4.1.2
		• What are the impacts of the Project on the historic Safford-Morenci Trail?	3.2.1.2.2; 4.4.1.2
	Agriculture/Grazing	• What are the impacts to prime/unique farmlands?	3.2.1.4; 4.3.1.4; 4.4.1.4
		• What are the impacts to cattle grazing and allottees?	3.2.1.4; 4.3.1.4; 4.4.1.4
	Encumbrances	• What are the impacts to existing rights-of-ways and easements, including the telephone easements on the Musnicki property?	3.2.1.3; 3.3.1.2.1; 4.3.1.3; 4.4.1.3
	Mineral Rights	• What are the impacts to the state's mineral estate in Section 32, T5S, R27E?	3.2.1.5; 4.3.1.5; 4.4.1.5
		• What are the impacts to third-party mining claims (i.e., Melody Claims)?	3.2.1.5; 4.3.1.5; 4.4.1.5
		• Would mineral rights of the selected and offered lands also be exchanged?	2.2.2; 3.2.1.5; 4.3.1.5; 4.4.1.5
	Surface Water Rights	• Would surface water rights be exchanged?	2.2.2; 3.2.1.6; 4.3.1.6; 4.4.1.6
	Noise/Vibration	• What are the impacts from blasting on the Mount Graham observatories?	3.2.1.7; 4.3.1.7; 4.4.1.7
	Visual Resources	• Will the Project affect nighttime visibility for the Mt. Graham observatories?	3.2.1.8.5; 4.3.1.8; 4.4.1.8
		• Will the Project affect the visual quality of the Gila Mountains?	3.2.1.8; 4.3.1.8; 4.4.1.8
	Hazardous Materials	• Would the Project affect hazardous materials?	3.2.1.9; 4.3.1.9; 4.4.1.9

Table 1-4 (continued). Scoping Issues Analyzed for the Proposed Dos Pobres/San Juan Project and Sections in this EIS Where Each Issue Is

MAJOR CATEGORY	SUBCATEGORY	COMMENT	DISCUSSED IN SECTIONS
Physical Resources	Climate	• What are the impacts to microclimate?	3.2.2.1; 4.3.2.1; 4.4.2.1
	Air Quality	• What are the impacts to air quality to the region and to the San Carlos Apache Reservation from emissions from criteria pollutants, including acids using in leaching?	3.2.2.2; 4.3.2.2; 4.4.2.2
		• Would any Class I airsheds within 100 km of the Project be impacted?	3.2.2.2.2; 4.3.2.2; 4.4.2.2
		• Does the Project conform with the State Implementation Plan?	4.3.2.2; 4.4.2.2
	Geology	• What is the mineral potential of the selected lands?	3.2.2.3.2.
	Soils	• What are the impacts on soils?	3.2.2.4; 4.3.2.4; 4.4.1.4
	Groundwater	• What are the impacts to groundwater quality?	3.2.2.5; 3.2.2.5.1; 4.3.2.5.2; 4.4.2.5.2
		• What are the impacts to groundwater quantity?	3.2.2.5.1; 4.3.2.5.1; 4.4.2.5.1
	Surface Water	• How would the Project affect water quality of the Gila River?	Table 4-40; 4.3.2.6.2
		• Would the Project affect water quantity of the Gila River?	3.2.2.6; 4.3.2.6.1
		• How would erosion potential and sedimentation be impacted?	4.3.2.4; 4.4.2.4
		• How would drainage patterns be impacted?	2.1.2.3.2; 3.2.2.6.4; 4.3.2.6.1; 4.3.2.6.4; 4.3.2.6.5
		• How will the Project affect floodplains (100-year frequency floods)?	3.2.2.6.4; 4.3.2.6.4
		• Will the mine pits fill with water, and if so, what would the water quality of these lakes be?	3.2.2.6.3; 4.3.2.6.3
		• What are the impacts to "waters of the U.S." (including streams and washes)?	3.2.2.6.5; 4.3.2.6.5

Table 1-4 (continued). Scoping Issues Analyzed for the Proposed Dos Pobres/San Juan Project and Sections in this EIS Where Each Issue Is

MAJOR CATEGORY	SUBCATEGORY	COMMENT	DISCUSSED IN SECTIONS
Biological Resources	Vegetation	• What are the impacts of the Project on riparian areas?	3.2.2.6.5; 3.2.3.1.2; 4.3.2.6.5; 4.3.3.1; 4.4.3.1
		• Will the Project impact wetlands?	3.2.2.6.5; 3.2.3.1.2; 4.3.2.6.5; 4.3.3.1; 4.4.3.1
	Wildlife	• What are the impacts of the Project on wildlife and wildlife habitats?	3.2.3.1; 3.2.3.2; 4.3.3.1; 4.3.3.2; 4.4.3.2
		• What are the impacts to wildlife (i.e., migratory birds, bats) from potential exposure to solution ponds/process waters?	4.3.3.2; 4.3.3.3
		• Will the Project impact big-game species?	3.2.3.2.1; 4.3.3.2; 4.4.3.2
	Special Status Species	• Would special interest species be impacted by the proposed Project?	3.2.3.3; 4.3.3.3; 4.4.3.3
		• Will the Project impact state-protected plant species?	3.2.3.3.1; 4.3.3.3; 4.4.3.3
	Biodiversity	• Will the Project adversely affect biodiversity in the region?	3.2.3.4; 4.3.3.4; 4.4.3.4
Cultural Resources	Archaeological Resources	• What are the impacts to historic and prehistoric resources?	3.2.4.1; 4.3.4.1; 4.4.4.1
		• What are the Indian cultural affiliations and resources on the selected lands?	3.2.4; 4.3.4.1; 4.4.4.1
	Traditional Cultural Properties	• What are the impacts to traditional cultural properties?	3.2.4.2; 4.3.4.2; 4.4.4.2

Table 1-4 (continued). Scoping Issues Analyzed for the Proposed Dos Pobres/San Juan Project and Sections in this EIS Where Each Issue Is

MAJOR CATEGORY	SUBCATEGORY	COMMENT	DISCUSSED IN SECTIONS
Socioeconomic Resources	Population/ Demographics	• What are the impacts to the local population and demographics?	3.2.5.1; 4.3.5.1; 4.4.5.1
		• What are the impacts of the Project on minority populations and/or low income groups?	3.2.5.1.1; 5.2
	Economy	• What are the impacts to the local and regional economy?	3.2.5.2; 4.3.5.2; 4.4.5.2
		• What are the impacts to Graham County's direct and indirect employment?	3.2.5.2.1; 4.3.5.2.1; 4.4.5.2.1
		• Will the Project impact nearby Indian communities? If so, how?	3.2.5.1.1; 4.3.5.2; 4.3.5.3; 4.3.6
		• How would the Project affect the local (county), state, and federal tax bases?	3.2.5.2.3; 4.3.5.2.3; 4.4.5.2.3
	Infrastructure	• How would the Project affect Graham County infrastructure (schools, medical facilities, utilities, etc.)?	3.2.5.3; 4.3.5.3; 4.4.5.3
	Transportation	• How would the Project affect local transportation and traffic?	2.1.2.3.5; 2.1.2.3.6; 3.2.5.4; 4.3.5.4; 4.4.5.4
Indian Trust Resources	Indian Trust Assets	• What are the impacts to Indian trust assets, including perfected and decreed water rights held by tribes from water use for mining?	3.2.6; 3.2.2.6; 4.3.6; 4.4.6; 4.3.2.6.1
Consultation and Coordination	Environmental Justice	• What efforts are being made to comply with environmental justice (vis-a-vis minorities, low-income, tribes)?	5.2

The San Carlos Apache Tribe disputes the southern boundary of its current reservation and claims that some lands proposed for exchange rightfully belong to the Tribe.
This comment reflects a longstanding issue between the San Carlos Apache Tribe (Tribe) and the federal government. The area of concern to the Tribe consists of about 40,000 acres of public and private land south of the current San Carlos Apache Reservation in the vicinity of Lone Star Mountain eastwards toward Bonita Creek. This area includes a portion of selected lands as well as two of the offered properties currently proposed for exchange with PDSI in the Land Exchange Alternative, as described in Chapter 2, Section 2.2.2.1.1. The Tribe also raised this issue in 1991 in protest of the Safford District Resource Management Plan; in 1994 during scoping for the Morenci and Safford Land Exchange EISs and; and most recently, to the former Assistant Secretary for Indian Affairs, Ada Deer, in December 1994.

About a year after creation of the San Carlos Apache Reservation in 1872, subsequent Executive Orders in 1873 and 1874 shifted the southern and eastern boundaries of the reservation, thereby returning some of the former reservation land to the public domain. In 1883, the General Land Office (GLO) issued Special Instructions to surveyor Paul Riecker to survey the new southern and eastern boundaries of the reservation. This survey established the current San Carlos Apache Reservation's southern boundary location as depicted in Figure 1-1. In response to the San Carlos Apache Tribe's concerns, the location of the Reservation boundary was reviewed in 1919 and in 1936 by the federal government. In 1919, the boundary location was reviewed by the Commissioner of the GLO and approved by the First Assistant Secretary of the Department of the Interior; in 1936, the location was again reviewed by the Office of the Solicitor and approved by the Acting Secretary of the Department of the Interior. Both reviews upheld the current boundary location as defined by the Rieker survey.

The Indian Claims Commission was set up in 1946 by Congress to address longstanding land and treaty grievances of various tribes. In June 1969, the Commission found that the San Carlos and White Mountain Apache tribes were entitiled to recover the "fair market value of their aboriginal title lands," which included, but were not limited to, lands covered in the Executive Orders of 1873 and 1874. The Commission awarded the San Carlos and White Mountain Apache tribes a final settlement of $4,900,000 in 1972 as fair compensation for all aboriginal lands that had previously been taken from the tribes without compensation, including all lands within the disputed area. Both the San Carlos and White Mountain Apache tribes agreed to accept this settlement by means of resolutions passed unanimously by both tribal councils.

When the San Carlos Apache Tribe raised the boundary dispute again in 1991 in its protest of the Safford District RMP, BLM acknowledged "the concern on the part of the San Carlos Apache Tribe over the land ownership in the Bonita Creek and mineral strip areas" (BLM's Partial Record of Decision, 1992, p.14). However, in correspondence with the Acting Tribal Chairman Raleigh Thompson, then-Arizona BLM State Director Lester Rosenkrance stated that after three separate governmental reviews of documentation pertinent to this issue (in 1919, 1936, and 1992), "we [BLM] must agree that the position of the southerly boundary of the San Carlos Indian Reservation, as identified by the monuments on the ground and surveys on file, as determined by the General Land Office and affirmed by the Secretary of the Interiod, does reflect the true location of the boundary" (Rosenkrance to Raleigh Thompson, 1992, p. 4). By this, BLM meant that the existing boundary, in its judgment, conforms to the original survey instructions issued by the General Land Office on May 19, 1883.

It is BLM's current position that this issue has been reviewed and addressed adequately by BLM and other federal entities; that the Tribe accepted fair compensation for all disputed aboriginal lands; and that no new information concerning the southern boundary of the reservation has been provided by the Tribe or the Bureau of Indian Affairs that warrants yet another review of the issue. Therefore, this issue will not be carried forth for further consideration in this EIS.

What are the foreseeable uses of the Lone Star area?
Section 2.2.2.1.2 in Chapter 2 describes the foreseeable uses of the selected lands, including the Lone Star area, as identified by PDSI.

What are the foreseeable uses of the offered lands with regard to development, grazing, and mineral entry?
Please refer to Chapter 2,Section 2.2.2.1.3 for a description of the foreseeable uses of the offered lands with regard to these land uses.

1.6.2.2.2 Socioeconomic Resources

Will the Project affect Safford's customs, culture, and small-town lifestyle?
This question is a quality-of-life issue of a highly subjective nature. The ID Team has determined that this issue should be addressed more directly through analysis of impacts to specific socioeconomic resources of the community that may contribute to an individual's quality of life in Safford. These resources include population and demographics, employment, taxes, traffic, housing, and infrastructure, all of which are addressed in this document. Individual readers can then determine whether the quality of life in Safford, as influenced by these community resources, will be impacted by the Project.

1.6.2.2.3 Realty Process

Will the mineral potential value of the selected lands be considered in the appraisals?
Yes. The mineral values of the selected lands are listed in Chapter 3 and are but one of the many variables considered in the land appraisals. The mineral values are derived from a BLM-approved mineral potential evaluation completed by a third party contractor. It should be noted that all of the economic orebody for the Dos Pobres mine and some for the San Juan mine is located on private lands already owned by PD.

Is the exchange fair in terms of resource values and acreage?
There are numerous federal regulations that the BLM must follow in considering a land exchange alternative to ensure that it is fair in terms of dollar values and in the public's interest (see Table 1-1). On the basis of the data and analyses presented in this EIS, the authorizing officer at the BLM will decide whether the public interest would be served by the exchange alternative(s) and the BLM's Record of Decision will reflect this consideration.

Are land exchanges with such acreage disparities common?
Yes, a disparity in acreage is more common than not for federal land exchanges. The regulations governing federal land exchanges require that, among other things, the selected and offered lands be of equal monetary value. It is rare that any two parcels of land of equal acreage but with different resources and/or different locations would be appraised at the same dollar value. For this Project, the acreage ratio of selected lands to offered lands is about 4.4 to 1. Given that the selected lands are located in a rural area and adjacent to private lands owned by PD, and that some of the offered lands, such as Tavasci Marsh and the Empire-Cienega properties, are located in or near areas that are desirable or that have high potential for residential/suburban development, this acreage disparity is not unexpected in order for the monetary values of the selected and offered lands to be equal.

Who will conduct the appraisals?
As individual offered properties as well as the selected lands must be appraised, both contract and BLM staff appraisers completed the appraisals for this project. All appraisers are "Certified General Appraisers" under Arizona law. All of the appraisals were reviewed by an independent BLM review appraiser to ensure adherence to standards and conformance with federal regulations.

What appraisal methods will be used to calculate the monetary value of the lands?
Appraisals completed by the BLM are regulated by federal laws, including the Federal Financial Institutions Reform, Recovery, and Enforcement Act of 1988 and Uniform Relocation Assistance and Real Property Act of 1970; appraisals are conducted under guidelines contained in the Uniform Appraisal Standards for Federal Land Acquisitions (Interagency Land Acquisition Conference 1992). These laws and regulations ensure that standardized procedures are used to determine the monetary values of the selected and offered lands.

In determining the dollar value of both the selected and offered lands, it is important to note that not all acres are created equal--for instance, an acre in downtown Phoenix does not have the same monetary value as an acre in downtown Safford. Among other variables, the appraisals consider the current and potential uses of the lands; the sales of similar types of land under arms-length circumstances; and the mineral potential of lands in which the mineral estate is being exchanged.

1.6.2.2.4 Regulatory/Permitting

What regulatory requirements (e.g., NEPA) would there be for future mining (i.e., Lone Star) if the land becomes private?
Loss of BLM administration and public ownership of the selected lands through an exchange does not mean loss of federal and/or state jurisdiction over mining or mining-related activities. Regardless of whether possible future mining activities at Lone Star or for sulfide operations at Dos Pobres occur on public or private lands, PDSI must secure a number of federal and state authorizations to implement such mining or mining-related activities. Table 1-1 provides a summary of these authorizations. Furthermore, many of these permits, such as the Clean Air Act Title V air quality permit (ADEQ jurisdiction), the Aquifer Protection Program permit (ADEQ jurisdiction), and the Arizona Mined Lands Reclamation requirements (State Mine Inspector's jurisdiction), provide for public notification and review prior to issuance of the permits, as well as review and reauthorization for any proposed major modifications of the mine activities for which a permit has been issued.

For mining activities on private lands in Arizona, the loss of BLM jurisdiction has two implications for the applicability of NEPA: 1) NEPA analysis *of an MPO by the BLM* would not apply; and 2) state reclamation requirements would replace federal reclamation requirements. Once BLM-administered public lands pass into private ownership, BLM is no longer responsible for authorization of the MPO under 43 CFR 3809 or NEPA analysis of an MPO. However, in order to implement mining on private lands, specific activities in a proponent's mine plan must be authorized by federal agencies, such as the COE and EPA, both of which have jurisdiction over aspects of the proposed mining under the Clean Water Act. Some of these permit approvals constitute major federal actions that would also be subject to NEPA analysis. In those instances, a federal agency other than the BLM would conduct NEPA analysis of the proposed mine activities within its jurisdiction even though the land is privately owned. Therefore, it is the loss of BLM authority in particular, and not federal authority in general, that is the consequence of the proposed land exchange.

With regard to the NEPA analysis of any future development of the Lone Star and Dos Pobres sulfide orebodies if the land exchange is approved (i.e., the lands become private), the currently known foreseeable uses would be subject to Clean Water Act permitting under the jurisdiction of the COE and EPA. With regard to state versus federal reclamation requirements, Table 4-27 provides a comparative summary of the similarities and differences between federal and state requirements.

"BLM should require PD to demonstrate they have practiced sound environmental management while operating the Morenci, Dos Pobres, and Lone Star mines."
Environmental standards have changed significantly over the 30 past years. Management practices that were considered acceptable in the past may no longer be adequate or permissible by today's standards. Thus, the decision of whether to authorize PDSI to implement its proposed MPO on public lands will be

based on Phelps Dodge's ability to demonstrate to the BLM that they can meet current, applicable environmental standards and will operate the Project in a prudent manner that prevents undue and unnecessary degradation of the land, as required by federal surface management regulations (43 CFR §3809). In addition, PDSI must demonstrate that they have met the environmental permitting standards of the state and other federal agencies, including the ADEQ, EPA, and COE. Considering the array and extent of environmental permitting and monitoring requirements involved in the permitting of a new mine on public or private lands and PD's long presence in the region, a review of past management practices will not be tracked as an issue in this EIS.

What measures are proposed for compliance monitoring for permits and reclamation? For monitoring the effectiveness of mitigation measures? What measures are proposed for compliance with NPDES and stormwater permit requirements?

Compliance monitoring is required by several laws and/or for the major permits to be issued for this Project: Air Quality Operating Permit; Aquifer Protection Program (APP) Permit; National Pollutant Discharge Elimination System (NPDES); solid and hazardous waste, including the Emergency Planning and Community Right-to-Know Act (EPCRA); and Arizona Mined Lands Reclamation Act. Monitoring activities for these permits and reclamation are briefly summarized below. Measures for monitoring the effectiveness of habitat mitigation and surface water quantity mitigation are identified in Appendix F.

Air Quality Operating Permit. ADEQ has the responsibility to require adequate monitoring, record-keeping and reporting for all permitted sources. Where an applicable requirement does not already exist, ADEQ is required to establish the appropriate monitoring, record-keeping and reporting requirements. The crushers, screens, conveyor transfer points, and ore bins associated with the Crushing/Material Handling System will be subject to federal New Source Performance Standards (NSPS) which require performance testing to ensure compliance with applicable particulate emission standards. Additionally, ADEQ will require, through conditions in the air quality operating permit, that PDSI comply with monitoring, record-keeping and reporting requirements for various other fugitive and point sources, including sources not subject to NSPS. ADEQ conducts periodic random inspections of permitted facilities to ensure compliance with permit requirements.

Aquifer Protection Permit. Under the Aquifer Protection Permit (APP) program, ADEQ requires quarterly monitoring of wells located down-gradient from potentially discharging facilities. Analytical results of water quality sampling are submitted to ADEQ on a quarterly basis. Other monitoring results, such as leak detection inspections of process ponds, are also included in the monitoring reports. Monitoring results from potential impacts to wildlife from exposure to process solutions at the excess solution containment ponds will also be incorporated in the APP monitoring reports. ADEQ conducts periodic inspections of facilities permitted under the APP Program.

NPDES Permit. Facilities with CWA Section 402 (NPDES) point source permits are required to monitor and report the water quality and volume of surface water discharges from specified outfalls to "Waters of the United States." These reports are submitted to EPA and ADEQ on a monthly basis. Additionally, EPA and ADEQ conduct periodic compliance inspections of NPDES permitted facilities.

Solid and Hazardous Waste. PDSI will be required to comply with the federal Resource Conservation and Recovery Act (RCRA) and state laws and regulations regulating solid and hazardous waste. These laws and regulations include requirements for handling, storage, transportation and disposal of hazardous wastes, as well as mandatory record-keeping, reporting and personnel training requirements. Additionally, EPA and ADEQ conduct periodic hazardous waste compliance inspections of facilities.

Emergency Planning and Community Right-to-Know Act. PDSI will be subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) which requires, under Section 313, that facilities in certain SIC codes meeting threshold requirements submit to EPA and the state-designated agency an annual Toxic Chemical Release Inventory (TRI) Reporting Form (Form R). Facilities are required to report annual chemical use, releases and other waste management activities of Section 313 chemicals, provided that certain activity thresholds are met, on the TRI Form R report. Section 313 includes a list of over 650 chemicals and chemical categories.

Other sections of EPCRA require:

- Notification to the State Emergency Response Commission (SERC) and Local Emergency Planning Committee (LEPC) if a facility has one or more "extremely hazardous substances" present on site in quantities greater than Threshold Planning Quantities (TPQs) established by EPA (Section 302-303);
- Immediate notification to the SERC and LEPC of the release of any "extremely hazardous substance" or any hazardous substance under CERCLA in amounts at or above the specified Reportable Quantities that EPA establishes for each substance (Section 304);
- Submission to the SERC, LEPC and local fire department a list of Material Data Safety Sheets (MSDSs), or copies of MSDSs, for any OSHA "hazardous chemical" present on site in quantities greater than 10,000 pounds (Section 311);
- Submission of other hazardous chemical inventory information (Section 312).

Arizona Mined Lands Reclamation Act. The Arizona Mined Lands Reclamation Act (AMLRA) provides that the Arizona State Mine Inspector may enter and inspect any mining facility subject to AMLRA. Facilities subject to the AMLRA are also required to submit detailed annual reclamation status reports to the State Mine Inspector.

What measures are proposed in the Project's pollution and spill prevention plans?
PD must develop, keep on-site, and make available for public review a pollution and spill prevention plan as part of its NPDES permit compliance. At this time, these measures are being developed as part of Project's environmental compliance. Pollution and spill prevention measures generally include best-management practices for erosion and sediment control, waste disposal control, and reducing the risk of spills or other accidental exposures of material and substances to stormwater runoff.

What level of reclamation bonding will be required?
A discussion of reclamation bonding is provided in Chapter 2, Section 2.1.2.4.6, Reclamation Costs and Bonding.

What measures are proposed to address mine waste and reclamation?
These measures are described in Chapter 2 in Section 2.1.2.3.4, Waste Management, in Section 2.1.2.3.5, Hazardous Materials Storage, Handling, and Transportation, and in Section 2.1.2.4, Closure and Reclamation Measures.

What is the acid-generating potential of stockpiles and pit walls and what preventative measures are proposed to protect groundwater and surface water from acid-generation?
Acid-base accounting studies conducted on composite samples of development rock indicated that there is very low potential for acid-generation from development rock stockpiles (see Section 2.1.2.1.6 for discussion of acid-base accounting studies) and from pit walls (Water Management Consultants 1998). Please refer to Chapter 2, Sections 2.1.2.3.2 and 2.1.2.3.3 for description of surface water and groundwater protection measures, respectively.

What is the projected water use of the mine?
PDSI projects its water needs at an average of 4,272 gallons per minute (6,891 af/yr) throughout the 16-year life of the Project. Please refer to Chapter 2, Section 2.3.1.4.1, Water Demand and Supply.

What would be the water source for the mine?
Groundwater pumped from a volcanic aquifer source has been identified as the Project's water source. Refer to Chapter 2, Section 2.3.1.4.1, Water Demand and Supply.

What is the potential impact to pit lake chemistry from using ammonium nitrate and fuel oil (ANFO) in the blasting process?
No impacts are expected to pit lake chemistry as a result of using ANFO as the amount of the explosive is calculated to be entirely consumed during the blast (K. Byrne, Southwest Energy, pers. comm.). It is possible that minute amounts of unconsumed ANFO may remain as residue, but since such residue would eventually be mined out of the pit(s) along with leach ore, it is expected that there would not be any ANFO left in the pit to affect pit lake chemistry.

1.6.2.2.5 Consultation and Coordination

"BLM and PD are colluding to facilitate an unfair exchange."
There have been no secret meetings or agreements between the BLM and PD for deceitful or fraudulent purposes (i.e., collusion).

Volume 1

Chapter 2: Alternatives Considered

CHAPTER 2

ALTERNATIVES CONSIDERED

This chapter presents the alternatives considered for the Dos Pobres/San Juan Project. Alternatives that were considered but not studied in detail are also described. The permitting agencies' preferred alternatives are identified. A summary table comparing environmental impacts of each alternative is provided at the end of this chapter.

A key element of this EIS is the understanding that the Proposed Action is the Mining Plan of Operations (MPO) for the Dos Pobres/San Juan Project (the Project). The land exchange originally proposed by Phelps Dodge (PD) in 1994 is now an alternative to the Project. A land exchange alternative is only relevant to the actions and decisions of the Bureau of Land Management (BLM), the lead agency (refer to Figure 1-3). Actions required of two of the cooperating agencies, which are the Corps of Engineers (COE) and the Environmental Protection Agency (EPA), focus on mining activities described in the proposed Mining Plan of Operations (MPO) and alternatives developed for that action during NEPA and Clean Water Act (CWA) review. The fourth cooperating agency, the Bureau of Indian Affairs (BIA), has no decision to make or permit to issue regarding this Project.

Because the decisions relevant to the decision-making agencies pertain to either mining-related activities or a land exchange, two "sets" of alternatives have been developed and are analyzed in this EIS. This organization is intended to clarify for the reader the respective decisions to be made by the BLM, COE, and EPA regarding the proposed Project, in light of each agency's specific land management and/or permitting authority. Each set of alternatives is presented separately. The first set, the Mine Plan Alternatives Set, presents the proposed Mining Plan of Operations (MPO) for the Project and alternative mine plans[1] developed by PD. The second set, called the Land Exchange Alternatives Set, presents a land exchange alternative that is based upon PD's original land exchange proposal made in 1994 to the BLM and since modified. Each set includes a No Action alternative that pertains to the specific agency decisions available within that set of alternatives. The No Action alternative is required by NEPA to provide a baseline against which impacts from action alternatives can be compared.

The only agency that can act upon the Land Exchange Alternatives Set is the BLM. If BLM selects the land exchange alternative, the result of this decision would be that PD would acquire ownership of the BLM-administered public lands identified in the land exchange alternative, including lands proposed for mining in their MPO. Under this scenario, BLM would not authorize or oversee an MPO since BLM has no authority to regulate mining on private lands (see Figure 1-3). If BLM selects the No Land Exchange (no action) alternative under the Land Exchange Alternatives Set, BLM must then select an alternative from the Mine Plan Alternatives Set to fulfill Section 3809 requirements under FLPMA. Regardless of the BLM decision(s), the permit decisions of the COE and EPA pertain only to activities described in one of the alternatives in the Mine Plan Alternatives Set, including a No Action (no permit) alternative.

As noted above, federal oversight of mining activities does not necessarily require a BLM presence. If BLM selects the land exchange alternative, it would not oversee the proposed mining, but PDSI's mining activities would still be subject to federal oversight through the COE's and EPA's jurisdiction under Sections 404 and

[1] The COE, pursuant to 40 CFR 230, completes an analysis of alternatives to identify the least environmentally damaging practicable alternative.

402 of the CWA, the Mine Safety and Health Administration (MSHA), and various other federal regulations listed in Table 1-1 in Chapter 1. Arizona Department of Environmental Quality would continue to oversee compliance with the Arizona Aquifer Protection Permit (APP) program and Clean Air Act air quality permit. The only other change in jurisdiction under the land exchange would be that the State Mine Inspector's Office and not the BLM, would oversee reclamation for mining.

2.1 MINE PLAN ALTERNATIVES SET

In this set, two mine plan alternatives are described: the Proposed Action (also called the Project or Alternative I in Appendix A) and the Partial Backfill of San Juan alternative (Alternative C in Appendix A).

2.1.1 Formulation of Mine Plan Alternatives

The formulation of alternatives to the proposed Mining Plan of Operations has been based upon information provided by Phelps Dodge Safford, Inc. (PDSI), BLM, COE, EPA, and BIA. The processes underlying the identification of MPO alternatives analyzed in this EIS are summarized below.

As part of CWA Section 404 permitting compliance, the COE conducts an analysis of alternatives[2] to identify practicable alternatives to the project which minimize impacts to waters of the United States. Practicable alternatives are defined as those that are "available and capable of being done, taking into account cost, existing technology, and logistics, in light of project purposes" (40 CFR 230.10(a)(2)). The COE's 404(b)(1) alternatives analysis is provided as Appendix A to this EIS.

NEPA requires that all reasonable alternatives be considered. Two MPO alternatives identified in the COE's 404(b)(1) alternatives analysis (including the Proposed Action) as practicable have been carried forth in this EIS under the Mine Plan Alternatives Set. These alternatives, and other reasonable alternatives, such as the land exchange alternative, developed to meet the Project's purpose and need, are further analyzed herein using additional evaluation criteria developed to address the issues raised during scoping (see Table 1-4 in Chapter 1). The two mine plan alternatives, one of which is the Proposed Action, are described in Sections 2.1.2 and 2.1.3.

2.1.2 Proposed Action Alternative

The Dos Pobres/San Juan Project (the Project) is an integrated mining operation that includes the development of two open pit mines, a crushing and material handling system, a common Solution Extraction/Electrowinning (SX/EW) processing facility and shared infrastructure and support facilities. Figure 2-1 provides a detailed site plan of the proposed Project. Based upon the current Mining Plan of Operations, the Project will produce approximately 2.9 billion pounds of salable copper over the Project's estimated 16-year mine production life. Project production will include the mining of approximately 626 million tons of oxide and sulfide leach ore and 385 million tons of lower grade and unmineralized material referred to herein as development rock. Total minable material amounts to approximately 1.01 billion tons resulting in a 0.6:1.0 non-ore to ore ratio. Construction of the SX/EW plant and associated support facilities will require approximately 15 months to complete and will start after completion of the Project's environmental permitting requirements. Construction of the crushing and material handling system will begin about two years after construction of the SX/EW plant. The Project would involve PD private lands, BLM-administered lands, and

[2] This analysis is referred to as a 404(b)(1) alternatives analysis pursuant to 40 CFR 230.

State of Arizona lands. Table 2-1 lists the approximate surface area[3] (in acres) disturbance by facility type and property ownership for the Project at completion of mining.

Table 2-1. Approximate Surface Area Disturbance by Facility Type and Property Status for the Dos Pobres/San Juan Project

Facility Description	Property Status (acres)			
	PDSI	BLM	STATE	TOTAL
Open Pits				
Dos Pobres*	308	0	0	308
San Juan*	179	162	0	341
Stockpiles				
Leach Pad	111	811	0	922
West Development Rock Stockpile	368	365	0	733
East Development Rock Stockpile	1	127	0	128
Other Facilities				
SX/EW Facility	0	27	0	27
Stormwater Impoundment	0	23	0	23
PLS Collection	0	12	0	12
Crush Convey System and Acid Unloading	1	45	0	46
Stormwater Diversions*	10	10	10	30
Retention/Detention Dams	7	3	0	10
Dos Pobres Site No. 1*	35	0	0	35
Dos Pobres Site No. 2*	50	0	0	50
Truck Shop Service Complex	0	20	0	20
Compactible Soil Borrow Source and Overburden Stockpiles	68	0	0	68
New Access Roads	13	32	0	45
Haul Roads	91	99	0	190
Soil Stockpiles	91	32	0	123
Aggregate Borrow Sources	49	97	0	146
Utilities/Communications	5	0	0	5
Temporary Laydown Areas	0	65	0	65
Miscellaneous (Main Gate, etc.)	0	5	0	5
TOTAL	1,387	1,935	10	3,332

* Some surface disturbance already exists at these locations.

[3] All acreage throughout this EIS are approximate. Final acreage for realty actions will be determined pending cadastral survey or some other approved method.

Mine and mining-related support facilities and operations that will be developed as part of this Project are described in detail below and organized into the following five subsections: Mining and Ore Processing Operations; Support and Ancillary Facilities; Environmental Protection Measures; Closure and Reclamation Measures; and Employment.

2.1.2.1 Mining and Ore Processing Operations

2.1.2.1.1 Open Pits. Under this plan of operations, two open pit mines, Dos Pobres and San Juan (see Figure 2-1), will be developed. Table 2-2 provides a summary of projected production rates for each of the mines during the 16-year life of the Project. Production rates are estimates based upon the current Project mine plan and could change as conditions and technologies change.[4]

Table 2-2. Projected Annual Production Rate in Tons for the Dos Pobres/ San Juan Project

Project Year	Dos Pobres Mine	San Juan Mine	ANNUAL TOTAL
1	0	0	0
2	74,695,000	0	74,695,000
3	93,677,000	0	93,677,000
4	92,637,000	0	92,637,000
5	55,182,000	35,755,000	90,937,000
6	64,432,000	26,485,000	90,917,000
7	35,515,000	55,205,000	90,720,000
8	81,342,000	8,840,000	90,182,000
9	54,861,000	23,457,000	78,318,000
10	27,813,000	37,054,000	64,867,000
11	24,717,000	29,913,000	54,630,000
12	20,283,000	34,941,000	55,224,000
13	10,477,000	41,290,000	51,767,000
14	0	50,062,000	50,062,000
15	0	24,128,000	24,128,000
16	0	8,343,000	8,343,000
TOTAL	**635,631,000**	**375,473,000**	**1,011,104,000**

The Dos Pobres open pit mine is located entirely on PDSI patented lands. Phelps Dodge implemented development work on the property for an underground mining operation during the 1960s and 1970s. Underground development of the sulfide ore body at Dos Pobres ceased in the early 1980s; however, the buildings and other facilities at Site No. 1 and Site No. 2 (see Figure 2-1) continue to be used by PDSI for mineral exploration work and other activities.

[4] This projection reflects the best data available from current mining planning and is the basis for the environmental evaluation herein. However, any significant deviation in estimated production rates would require modifying permits for air quality, groundwater protection, and surface waters under Section 404 and 402 of the Clean Water Act and would thereby trigger additional environmental evaluation.

Surrounding the planned Dos Pobres pit is an approximately 1,300-foot setback in which no leach pad or development rock stockpiles are planned (see Figure 2-1). This setback has been designed to allow for potential future mining of the deeper sulfide milling reserves that underlie the leachable ore at Dos Pobres.

At completion of leach mining operations, the Dos Pobres pit will be nearly circular with a diameter of approximately 4,200 feet and a depth of about 1,400 feet (2,600 feet above mean sea level). The pit design specifies a 50-foot bench height and 120-foot-wide haul roads with 10 percent gradient haulage ramps to develop a smoothed pit design and minable reserves. A 100-foot-high, 48° double bench configuration will be used for all areas of the pit except in the Tertiary Gila Mountain Volcanics located on the upper southwestern area of the deposit, where a 48° single bench design will be incorporated. Once the pit is further developed, the stability of side slopes will be reevaluated and bench design modified as necessary.

The San Juan property was mined for a short period around the turn of the century following discovery of high-grade chalcocite copper veins. Mining resumed at San Juan during the late 1960s and early 1970s with processing of ore from a small open pit to produce copper precipitate. Existing areas of disturbance at San Juan include the former mine pit, leach pads, development rock stockpiles, and concrete foundations from facilities associated with the former leach process operations. These existing disturbances occur on both private lands owned by PD and on public lands managed by the BLM.

Phelps Dodge acquired the San Juan property in 1994 and has since undertaken efforts to mitigate the effects of past mining activities. Cleanup efforts have included removing debris; installing an impermeable composite liner system in the existing leach solution collection pond; constructing six shallow reclaim wells in an interception trench upgradient of the stormwater collection pond, and construction of diversions to manage stormwater. Most of the areas of existing disturbance associated with the San Juan property fall within the San Juan pit limits currently planned for the Project.

At completion of mining, the San Juan pit will be somewhat oval-shaped with a length and width of approximately 5,000 feet and 3,800 feet, respectively. The ultimate depth of the pit will be approximately 1,000 feet (3,150 feet above mean sea level). The interamp angle for San Juan is based on a 48°, 100-foot-high, double bench configuration for all areas of the pit.

Leach ore and development rock (unmineralized and low-grade material) will be mined from the proposed Dos Pobres and San Juan open pits using conventional drilling and blasting techniques. Blast holes will be drilled in a grid pattern to an average depth of 65 feet, loaded with ammonium nitrate and fuel oil (ANFO) and topped off with a sand and gravel mixture. When the explosives are detonated, usually once a day and always during daylight hours, the hard rock will be reduced to a manageable size (called run-of-mine or ROM) for loading and hauling.

Depending on its copper content, ROM leach ore will be either hauled directly to the leach pad or hauled to a crushing system. Development rock will be hauled to two unlined development rock stockpiles, identified as East and West development rock stockpiles in Figure 2-1 (see also Section 2.1.2.1.6).

Three distinct periods of mining will occur during the 16-year life of the Project. The first period involves mining leach material exclusively from the Dos Pobres deposit during Years 1 through 4 (see Table 2-2). A pre-production period of four months will be required to expose the orebody and place ore on the leach pad to provide the surface area required to support initial operations. Mining rate during this period will average approximately 238,000 tons per day (tpd). Three electric shovels with 53 cubic-yard capacities, assisted by one, 21-cubic-yard hydraulic front-end loader, will provide the loading capacity required to maintain production. The drill fleet will consist of four production units capable of drilling 9⅞ inch- to 12¼-inch-diameter holes. Twenty-two haul trucks with 240-ton to 300-ton capacities will be required during this period.

During the second period (Years 5 to 13), mining operations at the Dos Pobres and San Juan deposits will be combined. During this time, the higher grade, higher stripping ratio leach ore from Dos Pobres will be mined in conjunction with the lower grade, lower stripping ratio leach ore from San Juan. By blending the leach ores from the two deposits, the overall mining rate will be held relatively constant at an average of approximately 248,000 tpd from Years 5 through 8. During this period, the required fleet of haul trucks will reach a peak of twenty-six, 240 to 300-ton capacity trucks due to longer haulage profiles. During the remainder of the period (Years 9 - 13), the mining rate and haul truck requirements will decline, with the mining rate averaging approximately 167,000 tpd. The Dos Pobres oxide leach reserve will be depleted at the end of this period.

The third period, Years 14 - 16, will consist entirely of mining the remainder of the San Juan deposit. Mining rates and copper cathode production will decline during this period. Average mining rates will be approximately 75,000 tpd. The San Juan reserves will be depleted at the end of this period.

2.1.2.1.2 Crushing and Material Handling. The crushing and conveying system is designed to handle 100,000 tpd. A two-stage, open circuit crushing facility will be employed to reduce ROM ore to a one-inch nominal size for stacking on the leach pad by haul trucks. The crushing plant will be located along the eastern side of the leach pad, between the Dos Pobres and San Juan pits. The truck loadout facility will be located at the southern end of the crushing and material handling facility.

The crushing plant flow diagram is presented in Figure 2-2. The primary crushing plant includes a fixed 60-inch x 89-inch or 60-inch x 110-inch primary gyratory crusher designed to be directly dump-fed by up to 340-ton-capacity haul trucks. The primary crusher will produce an 80 percent passing eight-inch size crushed ore product, which will be conveyed to a 30,000-ton, coarse ore surge pile. Ore will be reclaimed from the coarse ore surge pile by belt feeders and conveyed to the secondary crushing plant surge bin. In the secondary crushing plant, four double-deck vibrating screens will separate one-inch or smaller material from the ore flow stream, and the oversize material will be crushed to 80 percent passing one-inch size by four MP1000 (or equivalent) secondary crushers. The secondary crusher product will be combined with the screen undersize product and conveyed to a 30,000-ton, fine ore surge pile. Ore will be reclaimed from the fine ore surge pile by belt feeders and conveyed to two, 1,000-ton-capacity truck loadout bins, where it will be loaded onto mine haul trucks for transport to, and placement on, the leach pad.

Concentrated sulfuric acid (approximately 92 - 94 percent) will be added to the ore stream as it is transferred from conveyor to the load-out bins to precondition the ore to enhance leach recoveries. The sulfuric acid will be directly applied to the ore through low-volume spray nozzles. Structural components associated with the loadout bins will either use corrosion-resistant materials, or be provided with corrosion protection. The truck loadout chute/gate system will be of stainless steel construction to resist acid corrosion. In addition, a containment system designed to meet Best Available Demonstrated Control Technology (BADCT) criteria will be constructed for the facility pursuant to the requirements of the Arizona Aquifer Protection Permit Program, for which PDSI has initiated permitting efforts.

2.1.2.1.3. Leach Pad. A single, rectangular, approximately 922-acre leach pad will be located south of the Dos Pobres pit, between Cottonwood Wash on the east and Watson Wash on the west (see Figure 2-1). The leach pad will be developed from south to north in 20 to 25-foot-high lifts. Based on current projected production rates, the leach pad is expected to reach a height of approximately 400 to 450 feet but will be designed to accommodate a potential ultimate height up to 600 feet. The leach pad will be constructed with setback benches to achieve a final overall slope of no greater than two horizontal to one vertical (2H:1V) (see Figure 2-3). The top surface of the pad will ultimately slope at approximately the same degree as the existing natural terrain.

The site selected for the leach pad offers sufficient slope (generally steeper than four percent) to allow use of the natural contours of the terrain for collection of the copper-laden pregnant leach solution (PLS). Existing terrain in the northern portion of the pad is significantly steeper than in the southern portion.

The key elements of the leach pad design include the pad foundation, a composite liner system consisting of underliner material and a synthetic geomembrane liner, and overliner material (see Figure 2-3). The entire leach pad will be lined. The foundation will be prepared by clearing vegetation and rock rubble. The stripped subgrade surface will then be scarified and proof-rolled in preparation for placement of the underliner material.

Underliner material will consist of a 12-inch layer of compacted, clayey soils from the Lone Star compactible soil borrow source located on PD's private lands in the southwest corner of Section 25 (see Section 2.1.2.2.3). Soils from this source will be tested for gradation, moisture content, compactibility, permeability, and compression, and data from these tests will be used to verify suitability of the soils per Arizona Department of Environmental Quality's (ADEQ) criteria for Best Available Demonstrated Control Technology (BADCT) design standards. The soil will be compacted to a density equivalent to at least 90 percent of the maximum dry density (ASTM D-1557). This layer is expected to have a saturated hydraulic conductivity of approximately 10^{-6} cm/sec.

Covering the underliner material will be a synthetic geomembrane liner of at least 60-mil thickness. BADCT recommends that the liner design consider the potential for damage from the combination of vertical loading from the ore and the maximum grain size of the overliner material. A series of liner puncture tests is being conducted to verify the liner integrity under the simulated maximum pad height and liner system conditions. The type of synthetic liner that will be selected will meet the following criteria: 1) demonstrated performance and compatibility with PLS; 2) reliable and demonstrated installation procedures; 3) high quality of field seaming; 4) ability to test 100 percent of all seams and welds; and 5) resistance to degradation under ultraviolet (UV) light. As necessary, the geomembrane may be textured on one or both sides to meet design requirements for shearing resistance between the geomembrane and the underlying compacted soil and the overliner material.

Atop the synthetic liner will be an 18- to 24-inch layer of overliner material (potentially crushed or screened rock) that provides sufficient drainage to control the hydrostatic head on the liner. Permeability tests are being conducted on samples of overliner material under varying load conditions simulating different pad heights. These data will be used to size the thickness and particle size of the overliner material. Perforated underdrain pipes spaced to facilitate pad drainage will also be placed on top of the synthetic liner to maintain a low hydraulic head (Figure 2-3 shows cross section). Adequate internal drainage of the pad will maximize solution recovery and maintain the stability of the pad.

Construction of the composite liner system will begin at the downstream toe of the pad and proceed in an upstream direction. The liner system will be constructed incrementally over the first several years of operations. The leach pad will utilize existing ridge lines, constructed berms, and perimeter channels and internal piping to manage stormwater and PLS routing through and around the leach pad. Stormwater management activities associated with the leach pad will minimize the volume of stormwater that comes into contact with the pad and control stormwater which has contacted leach material.

The leach pad design includes an internal stormwater collection ditch (Figure 2-4) that will divert clean stormwater away from the pad during early years of operation, when the leach pad is confined to the southern portion of the site below the ditch. Later, this ditch will be incorporated into the leach pad system to provide for internal collection of PLS flows during leaching on the northern portion of the pad. The ditch will intercept PLS flows from the northern portion of the leach pad and direct them to the east edge of the pad where they will flow to the leach pad solution collection channel.

Raffinate, an acidic aqueous solution, will be applied to the leach pad using wobblers or drip emitters. As the leach solution percolates through the copper-bearing ore, it will dissolve soluble copper minerals contained in the rock. The copper-laden water, called pregnant leach solution, or PLS, will flow by gravity into a permeable gravel drain which is constructed directly on top of the geomembrane liner. Flow in this gravel drain will be collected in a series of perforated pipes which conduct the flow by gravity into a downstream, perimeter solution collection ditch. The solution collection ditch is located on the downgradient edges of the leach pad at the southern and southeastern limits (Figure 2-4). The solution collection ditch transfers PLS to the low point in the leach pad, which is immediately adjacent to the southeast corner. PLS will then exit the lined leach pad and be routed to either of the two basins within the lined excess process solution impoundment located at the southeastern toe of the pad, from where it will be routed directly to the PLS collection tank and eventually processed at the SX/EW plant.

2.1.2.1.4 Leach Solution Collection/Distribution Facilities. The leach solution collection/distribution system includes an excess process solution impoundment, a million-gallon PLS tank, and various piping and conveyance systems. All of these collection systems are located upgradient of the stormwater impoundment, and are designed such that excess flows are directed via lined channels to the stormwater impoundment. The system also includes two raffinate tanks at the SX/EW tankfarm that are fully contained within the lined tankfarm area and a raffinate booster tank located on the east side of the leach pad that is designed such that excess flow from the tank will drain to the leach pad solution collection channel.

PLS flow from the solution collection ditch enters the excess process solution impoundment, where it transitions to a pipeline. This pipeline conducts flows to the PLS collection tank, from which flows are drawn for processing at the SX/EW plant. Flows greater than that which can be processed by the SX/EW plant are retained in the lined excess process solution impoundment, from which they can be reintroduced into the PLS collection tank as required. Excess flows can also be drawn from excess process solution impoundment into the raffinate tank for return to the leach pad surface.

Construction of the lined excess process solution impoundment will be similar to the leach pad construction. The subgrade will be cleared, grubbed, and compacted, and overlain with a composite liner system consisting of a minimum of six inches of compacted clayey soil and a geomembrane double liner and leak collection and removal system (LCRS). The lower liner will consist of a single geomembrane of at least 60-mil thickness over a minimum six inches of soil compacted to achieve a saturated hydraulic conductivity of no greater than 10^{-6} cm/sec. The upper liner will be a single geomembrane of at least 60-mil thickness. Sandwiched between the two will be the LCRS, which has been designed to result in minimal hydraulic head on the lower liner and provide for the collection and removal of liquid between the upper and lower liners. Any PLS in the LCRS will be rerouted into the raffinate collection tank for reprocessing.

Raffinate will be pumped from the SX/EW plant through HDPE and stainless steel pipelines to the raffinate booster station tank located on the east side of the leach pad. The raffinate will then gravity flow (during early years of operation on the lower portion of the pad) or be pumped from the booster station to the active leaching areas within the upper portions of the leach pad. A second raffinate booster station will be required during later years of leaching operations. The second booster station will be located near the northeast corner of the leach pad at an elevation approximately 300 feet higher than the first booster station. PLS collected from the leach pad will be processed within the solution extraction and electrowinning processing facility to produce copper cathode for shipment off-site.

2.1.2.1.5 Solution Extraction and Electrowinning (SX/EW) Processing Facility. The solution extraction (SX) and electrowinning (EW) processing facility will consist of three primary components (SX plant, tank farm, and electrowinning tank house) (see Figure 2-5) and is located southwest of the leach pad.

The solution extraction plant (SX plant) will be located near the electrowinning tankhouse (EW tankhouse) at a site west of the stormwater impoundment. The SX plant will receive PLS from the PLS collection tank and will extract copper from the PLS for further processing in the EW tankhouse.

The SX plant will consist of four mixer-settler tank trains. Each train will include two extraction mixer-settler tanks, one wash mixer-settler tank, and one stripper mixer-settler tank. In the extraction mixer-settler tanks, PLS is mixed vigorously with an equal volume of an organic solution containing 90 percent petroleum-based diluent and 10 percent copper extraction reagent. After mixing, the solutions are allowed to separate. The aqueous solution, which has been stripped of its copper, is again called raffinate and settles to the bottom of the mixing tank and is then sent to an organic recovery tank to recover and recycle residual organic reagent back to the extraction tanks. This raffinate solution is then sent back to the leach pad for another leach cycle. The organic solution containing the copper ions, now called loaded organic, floats to the top of the settling tank and is pumped to the wash mixer-settler tank.

In the wash mixer-settler tank, the loaded organic solution is mixed with water to remove impurities. The washed organic solution then flows to the stripper mixer-settler unit and is mixed with an aqueous solution containing 20 percent sulfuric acid (electrolyte). An ion exchange process causes the copper ions to transfer from the loaded organic to the electrolyte, now referred to as rich electrolyte. Rich electrolyte is then pumped to the electrowinning tankhouse.

The electrowinning tankhouse, adjacent to the tank farm (refer to Figure 2-5), will house 280 electrowinning cells constructed of polymer-concrete, overhead cranes, and a cathode stripping machine. Rectifiers used to convert incoming electric power to direct current for the electrowinning process will be located outside the tankhouse. Propane or natural gas-fired boilers, used for heating electrolyte to 110°F to 125°F to increase electrowinning efficiency, will be housed in a small building nearby.

Inside the electrowinning tankhouse, the electrolyte is routed through a series of tanks, in which insoluble lead plates are hung as anodes. Stainless steel plates (also called "blanks") are suspended in the cells between the anodes and serve as cathodes onto which the copper will plate. Direct current electricity is applied to the anodes causing the copper ions in the electrolyte to plate onto the stainless steel blanks. The cathodes are removed from the cells after approximately seven days, and the copper is stripped from the stainless steel blank and shipped off-site for further processing into copper products. The partially depleted electrolyte solution in the EW cells is pumped back to the tankfarm facility for reuse, and the entire leaching and copper extraction process repeats itself.

The tankfarm is located between the solution extraction and electrowinning facilities. It will contain two one-million gallon raffinate tanks, a single one-million gallon runoff collection tank, electrolyte and reagent storage and process tanks, and solution filtration systems. The tankfarm will be an open air facility, constructed in a concrete-lined containment area excavated and designed to contain stormwater runoff and excess process solutions from the SX/EW operations area. These solutions will be collected in the one-million gallon stainless steel runoff collection tank constructed within the tankfarm containment area.

To keep organic solutions separated from aqueous solutions, all the loaded organic tanks, diluent and extractant storage tanks, and organic processing equipment are located together in one contained area of the tankfarm. This containment area for organic solutions is equipped with a sump and pump for recovering the solutions to the holding tanks.

2.1.2.1.6 Development Rock Stockpiles. Unmineralized and low grade material (referred to herein as development rock) will be hauled at ROM size to two unlined stockpiles that will not be leached. Development rock stockpiles will occupy approximately 861 acres total. One stockpile will be situated to the west of the Dos Pobres pit (the West development rock stockpile), and the other to the south of the San Juan

pit (the East development rock stockpile; see Figure 2-1). Stockpiles will be constructed in 50-foot lifts to approximately 400 feet above ground level.

A liner is not proposed for these development rock stockpiles as the neutralization capacity of the non-ore material (i.e., development rock) present within the orebody exceeds the rock's acid-generating potential (Dames & Moore 1997a). Analysis was performed on representative composite samples collected from the existing drill pulp archives for the Dos Pobres and San Juan orebodies. Twenty-two composite samples, representing more than 11,900 feet of drill core, were analyzed for acid-base accounting (ABA), synthetic precipitation leach procedure (SPLP), and a suite of 21 elements. Based on the ABA testing, the potential for development rock to generate a low (acidic) pH effluent is considered very low (PDSI 1996, Water Management Consultants 1998). The weighted average net neutralization potential of the composite samples is 49 tons calcite equivalent per 1000 tons.[5] SPLP tests were run on 22 samples representative of the range of lithological and mineralogical material to be included in the development rock stockpiles. The metal content of the effluent from each test was below Arizona Primary Drinking Water Standards maximum contaminant levels (mcl) (ibid.).

2.1.2.1.7 Soil and Growth Medium Stockpiles. Soil excavated during leach pad site preparation and suitable rock material excavated during mine pre-stripping will be stockpiled for use as growth media and capping material. Seven soil and growth medium stockpiles covering a total of roughly 123 acres will be created. They range in size from about two acres to about 51 acres. The locations of these stockpiles are depicted in Figure 2 -1. These stockpiles will be stabilized, as necessary, to prevent excessive losses from erosion and marked with signs identifying the material as soil. Other soil stockpiles may be developed if it is determined that sufficient soils exist in the footprints of the development rock stockpiles to economically justify excavation prior to the lateral build-out of the development rock stockpiles.

Stabilization of soil stockpiles would be accomplished by shaping slopes to minimize erosion and placing silt fence structures, as necessary, around the downgradient slope of the stockpiles. The side slopes will be shaped by a bulldozer traveling perpendicular to the slope, forming small berms to trap precipitation. Side-slopes and the tops of the soil stockpiles may be seeded with native perennial species as an additional erosion control measure if necessary.

2.1.2.2 Support and Ancillary Facilities

2.1.2.2.1 Water Supply. Based upon the results of the groundwater investigation program, PDSI has determined that an aquifer located in the volcanic rocks near Dos Pobres and San Juan will be developed to meet Project water requirements. This aquifer has historically provided approximately 1,400 gallons per minute (gpm) to the No. 1 shaft at Site No. 1. Investigations which have been underway since June of 1995 have indicated the presence of an aquifer capable of sustaining at least 5,000 gpm (8,065 af/yr) flow rate.

Water demand estimates for the Project have been based upon historical mine, shop, and SX/EW make-up requirements at other Phelps Dodge operations in Arizona and New Mexico as well as additional information developed during a Feasibility Study conducted by PDSI. The average amount of water required for the Project is forecast at 4,272 gpm (6,891 af/yr). On average, six percent of the leach solution flow rate will have to be replaced due to loss through evaporation and initial wetting of new leach ore. Table 2-3 summarizes the projected average water demand through the life of the Project.

[5] According to the British Columbia Acid Mine Drainage Task Force (BCAMDTF) criteria, rock that is non-acid-generating has a net neutralizing potential (NNP) of equal to or greater than 20 tons calcium carbonate over 1000 tons of rock.

Table 2-3. Projected Water Demand for the Dos Pobres/San Juan Project

Project Year	Mining[1] (gpm)	Crushing and Material Handling[2] (gpm)	SX/EW [3] (gpm)	Potable and Misc. (gpm)	Total (gpm)	Total Volume (af)
1	1,260	0	0	10	1,270	2,059
2	1,260	0	900	10	2,170	3,503
3	1,890	347	1,800	10	4,047	6,532
4	1,890	347	2,100	10	4,347	7,017
5	2,520	347	2,100	10	4,977	8,033
6	2,520	347	2,100	10	4,977	8,033
7	2,520	347	2,100	10	4,977	8,033
8	2,520	347	2,100	15	4,982	8,041
9	2,520	347	2,100	15	4,982	8,041
10	2,520	347	2,100	15	4,982	8,041
11	2,520	347	2,100	15	4,982	8,041
12	2,520	347	2,100	15	4,982	8,041
13	1,890	347	2,100	15	4,352	7,025
14	1,890	347	2,100	10	4,347	7,017
15	1,890	313	1,800	10	4,013	6,477
16	1,890	260	1,800	10	3,960	6,392
					TOTAL	**110,326**

[1] Assumes 630 gpm of water per water truck required for dust suppression purposes. This factor is based on historic water use of other PD facilities and includes water for drilling, dust suppression on roads and for other mining related activities.

[2] Assumes 5 gal/ton ore processed.

[3] Assumes six percent make-up for evaporative water loss and initial wetting of new ore.

Groundwater near the Dos Pobres and San Juan mines will be developed for use by the Project. Five 1,350 gpm vertical pumps are currently planned to will be established at wells constructed in the project area. Water will be pumped from wells to water storage tanks that will gravity feed to various project facilities. The main distribution tank (420,000 gallons) will be located near the mine fuel station; two head tanks (188,000 gallons each) will be located above Site No. 2; and a smaller tank (50,000 gallons) will be located at Site No. 1. The main distribution tank will supply water to the mines, the truck shop complex, and the crushing/material handling system. The head tanks at Site No. 2 will supply water to the SX/EW plant. An existing 95,000 gallon tank will supply water to the Administration Building, warehouse, and other facilities at Site No. 2.

2.1.2.2.2 Electric Power. The power system for the Project will include construction of about seven miles of a primary 230 kilovolt (kV) transmission line from the existing 230 kV Hackberry line to a main substation that will be located on Phelps Dodge's property west of the Lone Star Road. At the main substation, power will be transformed to 69 kV and distributed via approximately 17 miles of overhead transmission line to the mine areas, stormwater impoundment, raffinate booster station, crushing/material handling system, and the SX/EW substation.

A 69 kV powerline will be constructed around the Dos Pobres and San Juan pits to power two mine substations, a crusher substation, a maintenance area substation, a pumping substation, and the Site No. 2 substation. The mine substations will supply 7,200 volts (V) of power to the electric shovels and drills. The crusher substation will supply 4,160 V power for the crushing and material handling system. The maintenance area substation will provide 4,160 V power to the truckshop and maintenance shops near San Juan. The pumping substation will supply 4,160 V power for the raffinate pumps and stormwater impoundment dewatering pumps. The Site No. 2 substation will provide 4,160 V power to that area.

A separate 69 kV powerline will be constructed from the main substation to the SX/EW substation where voltage will be reduced to 13.8 kV for distribution to the EW tankhouse and the SX plant.

Transmission lines will be constructed using single pole structures for the 69 kV lines and H-frame double pole structures for the 230 kV line. All poles will be wooden and will range in height from 45 to 65 feet, except for the 230 kV power line structures, which will range in height from 75 to 85 feet. Transmission and distribution lines will be constructed to include raptor-protection, to minimize the potential for electrocution of perching birds of prey.

2.1.2.2.3 Compactible Soil Borrow Area. The Lone Star Compactible Soil Borrow Source is located on PD's private lands in Sec. 25, T6S, R26E (Figure 2-1). This site is approximately 4.5 miles southeast of the leach pad. Material from this borrow source will be used to construct the composite liner system for the leach pad and will be transported by truck to the leach pad along an approximately 110-foot-wide aggregate roadway. The borrow area will be approximately 50 acres in size.

The compactible soil material to be mined is approximately 10 feet below the surface; total excavation depth will be approximately 50 feet. Overburden removed to access the soil material will be stockpiled west of the borrow source and will cover roughly 18 acres. The compactible soil is primarily clay from a lake-bed deposit and is relatively homogeneous, with only occasional layers of fine sand or low plasticity clay and silt. The clay in this deposit is generally stiff and dry to lightly moist. Dust control measures per ADEQ requirements will be implemented at the borrow area.

2.1.2.2.4 Shops, Office, and Administration. A service complex that includes a heavy duty truck shop, maintenance shop, fire truck and ambulance building, cable repair shop, recycling center, oil and lubricant storage, fuel station, and a truck wash facility will be built south of the San Juan mine.

Site No. 2, west of the proposed leach pad location, is an existing facility that contains general offices, a change room building, and a warehouse facility. This site will be refurbished. All administrative support functions for the Project, such as operations management, mine planning, drafting, ore control, and safety will be conducted from the general offices. Mine operations and crew line-up will also be conducted from this site. The existing warehouse contains 11,000 square feet of storage space, which will be used for receiving, storing, and disbursing supplies and materials. In addition, Site No. 2 will be equipped with a service station for small vehicles.

2.1.2.2.5 Communications. Communications for the Project will include hard wiring of a telephone cable in a loop configuration between the main security gate, Site No. 2, the truck shop complex, and the SX/EW plant. Radio communications require construction of a repeater transmitter tower on a hill located south of the San Juan Mine (see Figure 2-1) and three base stations for use at the administration building, mine office, and SX/EW facility. The repeater facility will be a steel lattice structure approximately 120-ft tall with a 17 x 17 ft base, will cover approximately one acre, and will include a 12 x 16 ft concrete building to house radio equipment.

2.1.2.2.6 Transportation/Access/Security. New infrastructure requirements for the Project include upgrading existing access roads, constructing employee parking facilities, and establishing additional security gates. Road crossings and access and haul roads will be constructed with culverts or at grade. A fence will be constructed around the mine facility as needed to provide for security and safety and to keep cattle on adjacent lands off the mine property. This fence will tie into existing grazing allotment boundary fences wherever possible. A main security gate will be installed on the Phelps Dodge Mine Road (PD Mine Road) to control all traffic and access to the mines and SX/EW site. A secondary security gate will be installed on the San Juan Mine Road at the boundary of public and private lands, eliminating public access on this road. The main security gate will be equipped with automatic truck weigh scales which will weigh incoming and outgoing truck traffic and record deliveries through the use of bar coding. Employee parking will be provided at Site No. 2 and the SX/EW plant site.

PD Mine Road will be chip-sealed from its intersection with the Safford-Bryce Road to Site No. 2, roughly seven miles. Beyond this point, PD Mine Road and other access roads will be surfaced with aggregate. The current at-grade crossing of Talley Wash will be upgraded to a box culvert crossing to allow all-weather access.

New traffic to and from the site is expected to occur in two distinct phases: the 15-month construction phase and the 16-year operational phase. During the construction phase, traffic to and from the mine site will be associated primarily with construction workers and equipment deliveries and is estimated to peak at 1,708 vehicle trips per day (854 round trips), of which 208 are projected for deliveries and 1,500 are worker trips. Figure 2-6 depicts the anticipated peak distribution of vehicle trips over main roads and bridges during the construction phase of the Project; Figure 2-7 depicts average trip distribution for both trucks and employees over major roads in the region during the operational phase.

During the operational phase, average daily traffic is forecasted at 325 employee round trips and 104 truck round trips (Figure 2-7). Of the approximately 104 truck round trips to and from the Project, about 78 round trips (75 percent) are expected to come from the east and south and use the Solomon Bridge to cross the Gila River. The remaining 25 percent of trucks (26 round trips) are expected to arrive from the west and use the Thatcher Bridge (Reay Lane Bridge) to access the project site. These routes minimize truck travel through the major commercial area of Safford and the potential for traffic impacts.

The shipping company that PD will select to transport sulfuric acid to and from the mine will be required to comply with the applicable federal and state regulations governing the transport of cargo, including hazardous materials. One potential company has described the following internal controls that would apply to the transport of sulfuric acid (M. Maxwell, BJ Cecil Trucking, pers. comm.):

- No tanker deliveries will exceed the maximum 80,000 gross vehicle weight, therefore, overweight permits will not be necessary.
- Truck speeds are governed to 64 mph with a maximum cruising speed of 62 mph.
- Drivers must have MSHA and OSHA training.
- Mandatory vehicle check points will be established at specific locations along all haul routes.
- Vehicles will be checked by drivers at least every two hours or 100 miles.
- The tank trailers will be state-of-the-art with safety valves and rupture disks designed to minimize the potential for spills.
- In the event of an acid leak, soda ash or lime can be used to neutralize the acid.

2.1.2.2.7 Powder Magazine and Prill Storage. The powder magazine and ammonium nitrate prill storage will be located in the vicinity of Site No. 1, south of the existing Site No. 1 stormwater diversion channel.

2.1.2.2.8 Aggregate Materials. Aggregate materials will be used for a variety of purposes, including road base fill material, riprap for stormwater diversion channels and road crossings, aggregate for concrete, and other uses. Two aggregate borrow sources totaling about 146 acres have been identified within the project area (Figure 2-1). One is located just south of the leach pad; the other at an existing aggregate borrow source Watson Wash, west of the leach pad. Approximately 19 million tons of material will be excavated from aggregate borrow sources over the life of the Project. Of the material excavated, 40 to 60 percent could be suitable for use as aggregate after screening. The remainder of the material will be stockpiled for use in reclamation activities.

2.1.2.3 Environmental Protection Measures

A variety of environmental protection measures have been incorporated into the Mining Plan of Operations to meet applicable standards including those of regulatory agencies such as the ADEQ, COE, and EPA that have review and approval authority over the proposed Project. These measures range from integrated stormwater management programs to concurrent and post-closure reclamation plans. Environmental protection measures that have been incorporated into the mine plan are summarized below.

2.1.2.3.1 Wastewater Treatment (Non-Process Related). Septic systems will be constructed to handle sewage treatment at the SX/EW plant Site No. 1, Site No. 2, and the truck shop complex area. Septic sytems will be developed in compliance with ADEQ and Graham County's septic permits requirements.

2.1.2.3.2 Surface Water Management. The Project will be constructed and operated as a "zero-discharge" facility, meaning that all process waters and stormwaters that come into contact with process facilities will be contained on-site rather than discharged off-site into waters of the United States. Development of the Project as a zero-discharge facility will necessitate diverting stormwater around the project area to reduce run-on into the pits and ponding against stockpiles, and to prevent release of flows potentially impacted by the leaching or mining operations into surface waters. The stormwater management facilities are designed to ensure that there are no potential points of stormwater discharge from the mines for storms as large as the 100-year, 24-hour and 100-year, 10-day storm events. The stormwater impoundment will retain all incidental flows from the leach pad (including stormwater and leach pad drain-down that would occur during a power outage of up to 24-hours in duration). A series of retention dams located upstream, downstream, and within the footprints of the development rock stockpiles will prevent off-site surface water discharge from storms during the early years of mine development. As the size of the stockpiles increases, the potential runoff volumes will decrease, and the same structures are likely to provide equivalent protection against even large precipitation events. The general siting of proposed surface water control structures is depicted in Figure 2-1 and discussed in detail in the following sections.

Surface Water Diversions. Four diversion channels, South, Peterson Wash, West, and Site No. 1, will be constructed upgradient of the stockpiles and open pits to divert clean stormwater runoff around and through the site, preventing the water from being impacted by mining activities. A typical cross-section of a diversion channel is provided on Figure 2-8. The diversion channels will require energy dissipation structures at the outfalls and areas of fill where the alignments cross small drainages. A typical cross-section of riprap reinforced channel transition area is depicted in Figure 2-9. Energy dissipation riprap structures will be placed at locations where diversion channels discharge into existing washes. The criteria for riprap sizing and for apron dimensions are from Hydraulic Design of Energy Dissipaters for Culverts and Channels, Hydraulic Engineering Circular (HEC) 14, published by the Federal Highway Administration. Riprap is placed in areas of the apron excavated within alluvium and may not be in the areas of the apron excavated in rock.

In order to minimize the potential for erosion, specific design criteria have been developed to reduce the sharpness of curves in portions of the West and South diversion channels.[6] Channel sections that contain sharp curves will be constructed of riprap-lined fill material, with 2.5H:1V side-slopes. A conceptual detail for these areas of reduced radius of curvature is provided in Figure 2-10.

All four diversions are designed to control stormwater runoff from the 100-year/24-hour storm event (Dames & Moore 1998a). Each is briefly described below.

- West Diversion. This channel will run east to west across Watson Wash and unnamed tributaries of Watson Wash, upstream of the Dos Pobres development rock stockpile, and will convey stormwater runoff into an unnamed tributary of Coyote Wash. The West Diversion system will require three deep cuts through natural saddles along the alignment. The channel length will be approximately 13,500 feet long, with about 27 percent of its length requiring blasting.

  The channel alignments for the lower and upper portions of West Diversion are shown on Figures 2-11 and 2-12, respectively. The channel slope is set at 0.5 percent. Table 2-4 provides channel and fill dimensions at locations (identified as CRW1 through CRW6 on Figures 2-11 and 2-12) where steep topography makes reduction of the channel curves necessary. Table 2-5 provides dimensions of these energy dissipation riprap structures at locations where the channel discharges into the wash, for locations shown on Figures 2-11 and 2-12. A riprap apron is not planned at the outfall at section W9, shown on Figure 2-12, because of the relatively small contribution of flow at that location to the existing wash.

- Site No. 1 Diversion. This is an existing stormwater diversion structure and is approximately 2,800 feet in length. It runs generally west to east across Talley Wash, upstream of the Dos Pobres pit, and conveys stormwater runoff to an existing collection pond. It is designed to discharge water to Cottonwood Wash only during the 100-year/24-hour event.

- South Diversion. This channel will run north to south across drainages northeast of the San Juan mine, and will convey stormwater into an unnamed tributary of Peterson Wash. The channel length will be approximately 2,800 feet long and will be constructed in soil or rippable material.

  The channel alignment for the South Diversion is shown in Figure 2-13. The channel slope is set at 0.5 percent. Table 2-4 provides channel and fill dimensions at locations where curve reduction will be necessary (shown as cross sections CRS1 and CSR2 on Figure 2-13). Table 2-5 provides dimensions of energy dissipation riprap structures for the South Diversion channel transition into a tributary of Peterson Wash, as shown on Figure 2-13.

[6] The design criterion that was applied for the maximum radius of curvature is to maintain superelevation of design (100-year) flow depths against outer channel banks to less than 0.5 feet and maintain a radius of curvature at least twice the width of the channel top width or 50 feet, whichever is greater.

Table 2-4. Dimensions for Radius of Curvature for Diversion Channels

[Note: The radius of curvature reduction dimensions refer to Figure 2-10, where h = flow depth, H = channel depth, W = channel bed width, and L = average width of fill.]

Diversion Channel Curve	Min. Radius of Curvature* (ft)	Flow Depth (ft)	Channel Depth (ft)	Channel Bed Width (ft)	Ave. Width of Fill (ft)
West CRW1	82	4.2	5.5	20	115
West CRW2	85	4.5	6.0	20	130
West CRW3	85	4.5	6.0	20	100
West CRW4	85	4.5	6.0	20	120
West CRW5	85	4.5	6.0	20	170
West CRW6	110	7.0	9.0	20	300
South CRS1	68	2.9	4.0	15	120
South CRS2	59	3.8	5.0	15	170

Source: Dames & Moore 1998b, Table 2 and 1998c, Table 12

* For 0.5 ft of difference in superelevation

Table 2-5. Conceptual Design Dimensions for Riprap Apron (see Figure 2-9)

Riprap Location	Design Flow Rate (cfs)	Riprap Size, d_{50} (ft)	Dissipater Pool Length (ft)	Dissipater Pool Depth, h_s (ft)	Apron Length (ft)
West Diversion Outfall at Section W5	1,776	2.0	60	4.5	25
West Diversion Outfall at Section W3	2,000	2.0	60	5.5	30
West Diversion Outfall at Section W1	2,000	2.0	60	6.0	30
South Diversion Outfall at Section SO3	799	1.5	45	4.5	25
Peterson Wash Diversion Outfall at Section P2	2,670	2.0	75	7.5	40

Source: Dames & Moore, 1998b, Table 14

- Peterson Wash Diversion. This diversion will consist of an embankment in Peterson Wash and a channel that will run east to west upstream of the San Juan pit. The embankment structure will divert stormwater runoff into the channel on the west side of the wash. The embankment structure will be approximately 15 feet tall and will traverse the entire width of Peterson Wash. The channel length will be approximately 2,500 feet long and will be constructed in soil or rippable material.

The channel alignment for the diversion from Peterson Wash to Cottonwood Wash is shown in Figure 2-14. The channel slope varies between 1.5 to 4.0 percent and no curve reduction is anticipated. Table 2-5 provides dimensions of the energy dissipation riprap structures at locations where the channel will discharge into Cottonwood Wash as shown on Figure 2-14.

A typical cross section of the Peterson Wash diversion dam is depicted in Figure 2-15. The embankment would be 15 feet tall, constructed of impermeable material, have upstream and downstream slopes of 2H:1V and have a 15-foot crest width. The dam is designed to discharge directly into the constructed diversion channel and to have no reservoir storage.

Stormwater Retention Management System. An integrated stormwater retention management system will be used to control stormwater run-on and runoff from the leach pad and the West and East development rock stockpiles. The system will use lined collection ditches, both a lined excess process solution impoundment and a lined stormwater impoundment below the leach pad, and a series of retention dams below, within, and above the footprints of the development rock stockpiles. These facilities were designed for the worst-case scenario of 100-year/24-hour and 100-year/10-day storm events, during the period of pad development that corresponds to the potential maximum stormwater runoff (Dames & Moore 1998a).

- **Stormwater Impoundment**. Stormwater entering the leach pad perimeter will be conveyed to the stormwater impoundment designed to contain the 100-year/24-hour design storm event. The impoundment will be lined with a single, 60-mil, synthetic geomembrane liner over six inches of 3/8-inch-minus compacted, native or natural material such as screened soil. The impoundment is designed with a storage capacity of approximately 332 acre-feet, a volume sufficient to contain both drain-down of PLS and stormwater runoff from the leach pad that would occur if there was a 24-hour power outage at the mine during a 100-yr/24-hr storm event. The total surface area of the impoundment footprint is approximately 23 acres. The liner will be placed over a compacted soil layer at least six inches in thickness. The height of the embankment will be about 25 feet above the downstream toe. A small depression approximately 20 feet deep will be constructed in the south corner of the impoundment to serve as a pump sump. The stormwater evacuation system for the impoundment will consist of a gravity feed pipeline with a capacity of 3,000 gpm. This pipeline will convey stormwater to the SX/EW tankfarm for use as raffinate make-up water. Table 2-6 provides design characteristics of the stormwater impoundment.

Table 2-6. Design Characteristics of the Stormwater Impoundment

Design Characteristic	Specification
Storage Capacity (af)	332
Total Surface Area (ac)	23
Spillway Elevation (ft-msl)	3,430
Embankment Elevation (ft-msl)	3,433
Height of Embankment Above Downstream Toe (ft)	25
Downstream Embankment Slope (h:v)	2.5:1
Upstream Embankment Slope (h:v)	3:1
Stormwater Removal Capacity (gpm)	3,000

Source: Dames & Moore 1998a

- **Emergency Spillway**. To comply with dam safety design criteria, the stormwater impoundment's U-shaped embankment will be constructed with an emergency spillway at the northeast corner, preventing catastrophic dam overtopping by allowing flood waters to safely exit the dam. The spillway will be a side-channel type, cut into natural ground and lined with concrete as required to prevent scour. Assuming a full reservoir, no evacuation from the impoundment, and PLS inflow of 35,000 gpm during a storm event, the spillway

is designed to discharge into a natural drainage that is tributary to Talley Wash and has a minimum design capacity of the 100-year, 24-hour peak outflow from the impoundment.

- **Retention Dams.** Retention dams are designed collect stormwater runoff from the West and East development rock stockpiles. Additional retention dams will collect stormwater runoff upstream of the West development rock stockpile. The retention dams are located in four general locations relative to the West development rock stockpile footprint: 12 dams are located upstream (R dams), 11 dams are located within the footprint (W dams), and four dams are located downstream (DP dams); four other retention dams are located downstream of the East development rock stockpile (SJ dams). The locations of the retention dams upstream of, within the footprint, and below the West development rock stockpiles are shown on Figure 2-17. The retention dams downstream of the West and East development rock stockpiles are shown on Figure 2-18. The dams located within the footprints of the stockpiles and pad will be removed as necessary as the stockpiles and/or pad expand over their locations. The retention dams are sized to contain the 100-year/10-day storm event without discharge. Each dam is designed with 2H:1V upstream and downstream side-slopes, and with a 15-foot crest width (see Figure 2-19 for typical cross section). Retention dam heights and storage capacities that correspond to the locations depicted in Figures 2-17 and 2-18 are summarized in Table 2-7.

  The runoff volume estimated to reach each dam does not include rainfall on the top surface of the development rock stockpiles because the probability is low that the stockpiles will become sufficiently saturated to allow that water to report to the dams. Small berms will be placed, as needed, to direct runoff from the stockpile slopes to the dammed drainages. The dams will be constructed at a reasonable distance from the stockpile to avoid damage from the run-out of dumped development rock.

- **Internal Drainage Ditch.** A drainage ditch will be constructed approximately half-way along the alignment of the pad footprint to divert into Cottonwood Wash stormwater runoff that has not come into contact with mining activities. The ditch is designed to pass the 100-year, 24-hour peak flow of approximately 912 cfs; this peak flow which reflects the delayed flows captured in the detention dams constructed upstream. The ditch will be lined as construction of the leach pad progresses northward and will be used as a conduit for pipelines that will capture and transport PLS.

Other Facility Surface Water Management Systems. Diluent, reagents, fuel, and other petroleum products used in the operations will be stored in above-ground tanks within impervious secondary containment systems to avoid possible discharge to surface waters. All tanks will have leak detection systems. Secondary containment systems will have a capacity of at least 110 percent of the volume of the largest tank contained within the secondary containment facility. Sulfuric acid will be stored in tanks located within containment structures that can be drained to other containment facilities, such as the lined leach pad or the SX/EW tankfarm runoff tank. The SX/EW plant will be designed as a zero-discharge facility, incorporating drainage design features and containment tanks.

2.1.2.3.3 Groundwater Protection. Project facilities are subject to the requirements of the State of Arizona's Aquifer Protection Permit Program (APP) (Arizona Administrative Code R18-9-101 through 113) and PDSI is in the process of APP application review. Proposed groundwater protection measures include use of a liner system beneath the leach pad, stormwater controls, pumping systems, tank containment systems, and other features and operations designed to meet APP requirements. Key APP rules require that, among other things:

Table 2-7. Design Characteristics of Retention Dams

Dam	Spillway Height (ft)	Crest Height (ft)	Storage Capacity (ac-ft)	Approximate Width of Dam Base (ft)	Approximate Length of Dam Crest (ft)
R1	23.0	25.0	27.60	120	347
R2	24.2	26.2	16.10	120	238
R3	22.9	24.9	14.70	115	198
R4	28.9	30.9	13.40	145	237
R5	34.4	36.4	14.70	165	142
R6	15.7	17.7	8.00	90	226
R7	21.6	23.6	13.10	110	137
R8	39.2	38.2	13.40	175	142
R9	20.4	22.4	10.60	105	139
R10	19.0	21.0	4.20	n/a	76
R11	26.9	28.9	14.50	130	189
R12	22.3	24.3	4.60	115	185
W1	21.2	23.2	39.70	110	485
W2	12.5	14.5	3.60	75	240
W3	24.0	26.0	17.30	120	257
W4	21.0	23.0	13.40	110	101
W5	24.0	26.0	16.50	120	111
W6	20.3	22.3	8.60	105	94
W7	23.3	25.3	15.50	120	79
W8	24.0	26.0	22.40	120	153
W9	24.0	26.0	18.60	120	197
W10	23.4	25.4	24.80	120	267
W11	24.0	26.0	19.30	120	142
DP1	21.0	23.0	26.90	110	348
DP2	24.0	26.0	19.00	120	337
DP3	24.0	26.0	13.40	120	279
DP6	24.0	26.0	8.00	120	227
SJ1	9.0	11.0	13.80	60	81
SJ2	11.7	13.7	2.20	75	220
SJ3	23.1	25.1	7.80	120	231
SJ4	21.4	23.4	21.40	110	247

Source: Dames & Moore, 1998a, b, c
Note: Dams constructed with spillway heights less than 25 ft. and storage capacities less than 50 ac-ft are non-jurisdictional under ADWR Dam Safety Regulations. Dams with storage capacities less than 15 ac-ft are non-jurisdictional, regardless of spillway height.

1) PD demonstrate that the discharging facility(s) will not cause or contribute to a violation of numeric Aquifer Water Quality Standards;

2) the facility(s) be designed, constructed, and operated so as to ensure the greatest degree of discharge reduction achievable through application of Best Available Demonstrated Control Technology (BADCT), processes, operating methods, or other alternatives;

3) that there be regular monitoring of groundwater quality and quarterly reporting; and

4) that closure and post-closure plans describe measures to be taken to ensure continued compliance with applicable numeric Aquifer Water Quality Standards after closure of the facility(s).

PDSI has incorporated BADCT into facility designs to protect groundwater. Incorporation of BADCT design criteria demonstrates the facility(s) will be developed in a manner that achieves the greatest degree of demonstratable discharge reduction. The leach pad and excess process solution impoundment liner systems, lined stormwater impoundment, septic tank systems, truckwash, sulfuric acid storage, and other facilities and operations have been designed to meet BADCT criteria.

A groundwater monitoring program to verify that numeric Aquifer Water Quality Standards are not exceeded will be incorporated into the APP permit. Monitoring requirements include collection and analysis of groundwater samples from monitor wells to be installed at approved points of compliance for the mining operations. ADEQ will specify groundwater quality constituents to be monitored in the APP based on results of ongoing groundwater quality and material characterization studies.

A conceptual closure and post-closure strategy for the Project has been developed and will be included in the APP application (Dames & Moore 1997i). ADEQ requires conceptual closure strategies in the APP permit application that minimize stormwater run-on and infiltration and/or seepage from mine facilities that would affect aquifer water quality. In general, all potentially discharging facilities will either be closed in place or will undergo clean closure. Closure in place consists of leaving solid materials in place and, if necessary, providing a containment system that meets BADCT requirements. Possible closure in place activities include installing an infiltration-control cap or detoxifying the facility (by means of rinsing) such that further discharge is unlikely. Clean closure consists of removing and properly disposing of all liquid and solid waste, unused or recyclable chemicals, and impacted materials from the facility (including removing underlying impacted soils to appropriate industrial health- or risk-based levels). The APP closure strategy for the Project will complement the proposed reclamation plan to achieve continued compliance with applicable numeric Aquifer Water Quality Standards.

2.1.2.3.4 Waste Management. Solid waste generated at the Project will be disposed of in a manner consistent with ADEQ regulations. Solid waste will be transported off-site to an approved disposal or recycling facility. Office trash will be disposed of at the county landfill near Safford. Used petroleum products will be transported to a contracted recycling company in accordance with state and federal regulations. Nearly all scrap metal, most used HDPE pipe, and some construction debris will be recycled. Wastes determined to be hazardous under state and federal laws will be properly packaged and transported by a permitted transporter to an EPA-approved hazardous waste treatment, storage, or disposal facility. A pollution prevention plan, as required by the EPA, will be developed by PDSI prior to Project construction in order to minimize waste generation at the Project through source reduction, reuse, and recycling.

2.1.2.3.5 Hazardous Materials Storage, Handling, and Transport. Sulfuric acid, diluent, reagents, fuel, and other petroleum products used in the operations will be stored in above-ground tanks situated within impervious secondary containment systems having a containment capacity of at least 110 percent of the volume of the largest tank therein. Table 2-8 provides a list of regulated materials, the approximate on-site storage capacity, and their locations of use at the Project.

PDSI personnel handling hazardous materials will receive appropriate training that meets the applicable requirements prescribed by ADEQ, EPA, and the U.S. Department of Transportation. Additionally, employees will receive safety training required by the Mine Safety and Health Administration (MSHA) and other training prescribed by PDSI policies. PDSI will require that contractors transporting sulfuric acid or other hazardous materials to or from the Project certify that their drivers meet all the applicable training requirements prescribed by law and perform in accordance with PDSI environmental policies and safety standards.

Table 2-8. Regulated Materials to be Used and Stored at the Dos Pobres/San Juan Project

TANK LOCATION	REGULATED MATERIAL	ON-SITE STORAGE CAPACITY*	USE
Site No. 1 Explosive Storage Area (powder magazine)	Diesel fuel	25,000 gal	Used for blasting (fuel oil component of ANFO)
	Miscellaneous blasting materials	Various quantities of boosters, primer cord, delay caps, etc.	Used for blasting
Site No. 2 Fueling Station	Gasoline	20,000 gal (two 10,000 gal tanks)	Small vehicle service
	Diesel fuel	5,000 gal	Small vehicle service
	Propane	15,000 gal	Used in water heaters and heating of offices
SX/EW Plant	Concentrated sulfuric acid (92-94%)	335,000 gal	Provides make-up acid for electrolyte
	Propane	30,000 gal (two 15,000 gal tanks)	Used in water boilers
SX/EW Plant (EW Tankhouse)	EW surfactant	500 gal (supplied in totes, no storage tank)	Added to electrolyte
SX/EW Tankfarm	Diluent	50,000 gal	Used in SX process
	Extraction reagent	30,000 gal (two 15,000 gal tanks)	Used in SX process
	Cobalt sulfate pentahydrate (~8% cobalt solution)	15,000 gal	Added to electrolyte
Truck Shop Service Complex	Gasoline	20,000 gal (two 10,000 gal tanks)	Small vehicle service
	Diesel fuel	10,000 gal	Misc. vehicle service
	Anti-freeze (ethylene glycol)	23,500 gal (one15,000 storage tank, one 8,500 mix tank)	Misc. vehicle service
	Propane	15,000 gal	Heating and water heaters
Mine Fueling Station	Gasoline	20,000 gal (two 10,000 gal tanks)	Small vehicle service
	Diesel fuel	175,000 gal	Haul truck/heavy equip. service
Near Secondary Crushing Plant (east side of Leach Pad)	Concentrated sulfuric acid (92-94%)	2,660,000 gal (two 1,330,000 gal tanks)	Provides make-up acid for raffinate

Source: J. Korolsky, PDSI

* Tank storage capacity does not necessarily represent amount actually used or stored on-site.

PDSI estimates that approximately 3/4 of the daily tanker truck deliveries will arrive from the south via Highway 191 or east via Highway 70 and the remaining ¼ will arrive from the west via Highway 70 from Globe (see Figure 2-7). Trucks arriving to the Project from the west will cross the Gila River at the Reay Lane Bridge and enter the mine site via PD Mine Road. Trucks coming from the south on Highway 191 or from the east on Highway 70 will cross the river at the Solomon Bridge and then access the Project via PD Mine Road. No tanker trucks are expected to use the existing, narrow 8th Avenue (Safford) Bridge to access the mine site in order to minimize traffic impacts in town.

2.1.2.3.6 Sulfuric Acid Storage and Transport. Sulfuric acid will be shipped to the Project in tanker trucks and stored on-site in carbon steel tanks. The SX/EW operations will include two, 10,000-ton (1,250,000 gal)

sulfuric acid storage tanks near the secondary crushing plant for raffinate acid addition and one, 2,500-ton (312,000 gal) storage tank at the SX/EW facility to provide make-up acid to the SX plant. All three tanks will be situated in acid-resistant, concrete secondary containment facilities that can be gravity drained to other containment areas, such as the lined leach pad and the one-million gallon stainless steel runoff collection tank located in the tankfarm.

Sulfuric acid consumption rates over the life of the Project are estimated to average about 2,500 tpd (about 312,500 gpd) with a peak consumption rate of approximately 3,600 tpd (about 450,000 gpd). These rates will require, on average, approximately 94 truck loads of acid per day, peaking at 133 loads per day during peak consumption periods.

2.1.2.3.7 Other Reagents. Reagents used and stored in the SX/EW area include diluent, extractant, and cobalt sulfate. These reagents will be stored in tanks located in the SX/EW tankfarm. The tankfarm is designed as a containment area. Process solution bypasses and stormwater runoff are collected in the tankfarm drainage system, which incorporates the one-million gallon runoff tank located within the tankfarm.

SX diluent will be supplied by tanker truck and stored in a 20-foot-diameter carbon steel tank located in the containment area of the tankfarm. Diluent can be pumped either to the organic mixing tanks, or directly to the SX trains. SX extractants will also be supplied by tanker truck and stored in extraction reagent storage tanks located in the tankfarm. Each tank is equipped with a centrifugal pump for distribution to the organic mixing tanks for reagent mixing.

Cobalt sulfate pentahydrate solution will be supplied by tanker to a storage tank located in the upper area of the tankfarm near the electrolyte recirculation tank.

2.1.2.3.8 Fuel Storage and Distribution. Diesel fuel and gasoline will be supplied to the Project by tanker trucks. The trucks will travel directly to one of three fueling stations and offload into above-ground storage tanks that will be provided with secondary containment systems. The first fueling station, the mine fuel station, will be located between the Dos Pobres and San Juan pits. It will service mine haul trucks as well as smaller vehicles. Storage tanks for this fueling station will be within a bermed area lined with polyvinyl chloride (PVC) or HDPE. A heavy equipment fuel dispensing area will be located on one side of the storage area, and a dispensing area for smaller vehicles will be located on the opposite side.

The second fuel station, servicing smaller vehicles and equipment, will be located at the truck shop complex. Storage tanks for this station will be mounted on skids and placed within a concrete containment area equipped with a sump. In addition, a steel, pre-engineered fuel, lubrication, and storage building will be placed at this site.

The third fuel station, the Mine Office Fuel Station, will be located at Site No. 2. and will only service smaller vehicles. As part of its NPDES permit requirements, PDSI will develop a Spill Prevention Control and Countermeasures (SPCC) Plan to address requirements for preventing accidental spills of petroleum products and procedures to be followed in the event of a spill.

2.1.2.3.9 Air Resources.

Air Quality Control Permit. The Project must and will meet all applicable state and federal air quality standards. These standards prescribe emission limits, operational practices and administrative requirements. The purpose of these standards is to ensure that emissions are sufficiently reduced so as to prevent any exceedances of health-based, maximum allowable ambient concentrations.

PDSI will utilize proven control equipment, innovative process designs and responsible operating practices as methods to minimize air emissions. These operating practices and compliance with the terms and conditions of the permit will ensure that Project operations are in compliance with applicable air quality standards. The following sections discuss control measures to be implemented to minimize emissions from Project activities and processes.

Crushing and Material Handling Dust Control System. Dust control for the crushing and material handling system will be accomplished by a combination of dust collection and suppression applications by specific area. These methods are described below. Refer to the crushing and material handling system flow diagram (Figure 2-2) for additional information.

Primary Crushing Plant. Each side of the truck dump pocket will have fog nozzles located in the pocket. The fog nozzles will be activated by a proximity sensor to control dust formation as each haul truck unloads into the primary crusher pocket.

Dust-laden air will be filtered and exhausted from the pocket under the crusher and from the apron feeder discharge chute. The system will include an air pulse, baghouse dust collector and will be sized to exhaust approximately 18,000 standard cubic feet per minute (scfm). Cleaned air will be exhausted to the atmosphere via an exhaust fan. Collected dust will be discharged to an agitated tank via a rotary valve and then mixed with water. The resulting slurry will be pumped to the crusher surge bin and mixed with the ore stream.

Coarse Ore Surge Pile. Two water-wetting systems will be installed for dust control and suppression at the discharge point of the primary crushing discharge conveyor (CV-1) to the coarse ore surge pile. The first system will pre-wet the ore stream on CV-1 before it discharges onto the coarse ore surge pile. The second system will control fine material at the discharge point with a ring spray header installed around the discharge ore flow stream. This dual-wetting system will control dust formation before the crushed ore falls onto the surge pile. Each reclaim belt feeder will have fog nozzles installed at the hooded discharge to the coarse ore conveyor to control dust formation.

Secondary Crushing and Screening Plant. Coarse ore will report to the secondary crushing and screening plant feed bins via conveyor CV-2, then will be distributed to bins by transfer conveyor, CV-3. An air pulse standard bin vent, sized for approximately 1,000 scfm, will filter and exhaust air from the bin plenum. The system will discharge cleaned air to the atmosphere via an exhaust fan, and deposit collected dust directly back into the bin.

Dust-laden air will be filtered and exhausted from the screen enclosures (10,000 scfm per screen), and from the crusher discharge conveyor hood (1,000 scfm before and 4,000 scfm following each crusher). Cleaned air will be exhausted to the atmosphere via an exhaust fan. Collected dust will be discharged via a screw conveyor to a pug mill-type mixer where it will be agglomerated with water and discharged onto the screen undersize conveyor.

An atomized water spray system with fog nozzles will be installed at the discharge of the coarse ore discharge conveyor to the screen bin conveyor to control dust emissions in the bin distribution system. Additional atomized water spray systems with fog nozzles will be installed at the transfer points of the screen undersize conveyor (CV-4), and the secondary crusher conveyor (CV-5) to the secondary crushing discharge conveyor (CV-6), to control dust at the transfer points.

Fine Ore Surge Pile. Two water wetting systems will be installed for dust control and suppression at the discharge point of the secondary crushing discharge conveyor to the fine ore surge pile. The first system will pre-wet the ore stream on the secondary crushing discharge conveyor before it

discharges onto the fine ore surge pile. The second system will control fine material in the discharge with a spray ring header installed around the discharged ore flow stream before it falls onto the surge pile. Each feeder will have fog nozzles installed at the discharge to the coarse ore conveyor. Approximately 1.2 gpm of filtered water per feeder and 60 ft^3/m to 90 ft^3/m of compressed air will be required per feeder.

Truck Loadout Bins. An air pulse standard bin vent, sized for approximately 1,000 scfm will filter and exhaust air from each bin. Cleaned air will be exhausted to the atmosphere via an exhaust fan. Collected dust will be discharged directly back into the bins.

Sulfuric acid will be added to the ore stream at the transfer point of the fine ore storage discharge conveyor, CV-7, to the truck loadout bins as a pretreatment to enhance leach recoveries. The acid, which will be applied through low flow spray nozzles, will also suppress dust formation as the ore is discharged to the bins.

Tankhouse Acid Mist Suppression. During the electrowinning process, oxygen liberated from the electrolyte solution at the face of the anode forms small bubbles which rise through the solution. As the bubbles reach the surface, they release droplets of sulfuric acid solution immediately above the cell. Some droplets coalesce and settle back into the cell, while others become suspended in the air in the form of a fine mist. A portion of the acid mist eventually settles out elsewhere in the tankhouse; however, some of acid mist may exit the building through openings in the tankhouse roof or sides.
Acid mist that is generated in the tankhouse from electrowinning processes will be controlled with the use of a combination of passive control systems. Control methods currently being evaluated include:

- **Heat-retention beads (HRBs).** These small plastic devices form a floating layer of insulation on top of the cell that helps reduce heat loss from the electrolyte. The floating layer of beads also serves to coalesce the droplets generated by the bursting bubbles, significantly reducing the amount of mist that becomes airborne.

- **Surfactants.** These specialized chemicals modify the surface tension of the electrolyte at the surface of the cell, effectively altering the way bubbles form and burst. This action reduces the amount of mist that is generated.

- **Foggers.** PDSI is currently evaluating the practicability and effectiveness of water fogging systems for reducing acid mist emissions. Water sprays are typically used to control sulfate buildup above electrowinning cells. Very fine water mist spray systems (fogging systems) above the cells are being evaluated to determine if they would also be effective in controlling acid mist by creating a saturated zone immediately above the cell where droplets of acid would coalesce and settle back into the cell.

- **Cell brushes.** Cell brushes are plastic or fiber devices that attach to the anodes above the surface of the electrolyte. The cell brushes serve to coalesce the mist droplets such that the droplets eventually fall and are reabsorbed into the electrolyte. PDSI is currently testing cell brushes to determine if operational problems associated with the devices can be overcome.

Volatile Organic Compounds (VOCs). Emissions of volatile organic compounds (VOCs) result from the combustion or evaporation of certain organic compounds, such as petroleum-based fuels, solvents, and diluents. The primary source of VOC emissions at the Project is expected to be the evaporation of diluent used in the solution extraction process. Diluent is a highly-refined petroleum

product that is used as a carrier for the viscous copper extraction reagent. Together these products comprise the organic solution used in the SX process. Typically, the organic solution contains about 90 to 95 percent diluent and 5 to 10 percent copper extraction reagent.

The emissions of VOCs from SX process tanks will be minimized through engineering designs and reagent selection. Solution extraction mix boxes will be totally enclosed and settling tanks will be constructed with enclosures extending beyond the organic weirs.

PDSI will evaluate various diluents available from different manufacturers in order to select a product that will meet operational requirements and have a sufficiently low vapor pressure such that evaporation losses are minimized.

Fugitive Particulate Emissions from Roads. Fugitive particulate (dust) emissions from haul roads and unpaved primary access roads will be controlled by the application of water and, in certain areas, commercial dust suppressants. Water trucks will be employed 24 hours per day, as needed, to water haul roads and major access roads.

Boiler Combustion Gases. Boilers will be used at the SX/EW facility to heat water which will then be used to heat electrolyte to improve electrowinning efficiency. Combustion gases will be generated by the burning of fuel in the boilers. Emissions of regulated pollutants from the boilers will be minimized through the use of clean-burning fuels, such as propane and/or natural gas.

2.1.2.4 Closure and Reclamation Measures

In addition to the conceptual closure plan submitted in its APP permit application, PDSI prepared and submitted a reclamation plan to the BLM (PDSI 1997). This plan was developed to meet both federal and state reclamation requirements. The reclamation measures presented in the plan were intended to achieve productive post-mining land uses (PMLU) as required by both federal and state regulations. Types of PMLUs envisioned for the project area include 1) wildlife habitat and limited grazing; 2) recreation, tourism, and education; 3) industrial development; 4) future mineral exploration and mine development; and 5) management of environmental resources including visual, air, water, and soil. The long-term reclamation objectives of the Dos Pobres/San Juan Project Reclamation Plan are listed below.

- Establish wildlife habitat at selected facilities including the development rock stockpiles, borrow sites, and locations where buildings and other structures are removed.
- Provide scenic overview location(s) in the mining district that support education and tourism for people traveling in the area, thereby, enhancing the economic base of Graham County and addressing visual and recreation resource values.
- Protect public health and safety by controlling access to certain mining facilities, such as the open pits, through proper management of access roads, fencing, and gates.
- Provide the basis of an expanded commercial and industrial complex (e.g., a small industrial park) during mining and post-mining by utilization of existing infrastructure (e.g., truck shop).
- Anticipate future mineral exploration and development as technologies advance which may support the reprocessing of stockpile material, and mining of material below the current ore cut-off grade.
- Maintain access to recreation resources near and adjacent the project area to the extent practicable while protecting the safety of recreational users.

- Implement interim and concurrent reclamation and drainage control programs to facilitate long-term stabilization and closure requirements.

- Coordinate reclamation activities with requirements of the Arizona Department of Environmental Quality's Aquifer Protection Permit (APP) program to efficiently meet the collective reclamation and closure requirements including management of process materials.

- Establish stable slopes and appropriate vegetation ground cover using native plant materials as described in PDSI's reclamation plan.

Reclamation of surface disturbance within the project area will be an ongoing component of Project operations. Interim reclamation and testing programs, such as revegetation on the pad side slopes, will help to identify practicable reclamation techniques for concurrent reclamation efforts and development of long-term strategies. Interim programs will focus on the reduction and prevention of erosion through implementation of drainage stabilization and erosion control programs, and a program involving selective contouring and seeding of surface disturbances associated with Project construction, such as peripheral areas around buildings, areas adjacent to roads, soil stockpiles, etc. Concurrent reclamation and testing activities will be implemented at selected mining units, including portions of the leach pad and development rock stockpiles as they become permanently inactive. Primary elements of the reclamation plan are summarized below and discussed in greater detail in the Dos Pobres/San Juan Reclamation Plan submitted to the BLM.

2.1.2.4.1 Public Safety. One of the primary objectives of BLM regulations and the Arizona State Mined Land Reclamation Act is to ensure public safety. The following measures will be implemented prior to and during reclamation to reduce or eliminate potential hazards within disturbed areas after mine closure: 1) construction of physical barriers such as fences, berms, and rocks; 2) placement of warning signs; 3) stabilization of slopes; 4) demolition of unneeded buildings; and 5) proper disposal of debris.

When practical, physical barriers will be constructed around open pits to restrict public access. Standard four-strand barbed wire safety fences will be constructed around most of the pit perimeter and six-foot-high chain link fencing will be placed along sections of the open pits that are accessible to public traffic, including designated public overlooks and other areas adjacent to public roads.
The final configurations of leach pad and development rock stockpiles are characterized by geotechnically and erosionally sound slopes (Dames & Moore 1996). The non-uniformity of particle sizes of the ROM-sized material results in a filtering or packing effect which naturally limits erosion. While the overall slope design of the leach pad is expected to minimize erosion in areas composed of crushed ore, PDSI will evaluate these areas during leach operations to determine if other erosion mitigation measures are necessary. The final configuration of the leach pad has been determined to be geotechnically stable under static and pseudo-static conditions (Dames & Moore 1996).

While pit wall stability during mining is mandated by Mine Safety and Health Administration (MSHA) regulations, the design of economic pit slopes does not always result in the long-term stability of the inter-bench pit walls following mine closure. Following mine closure it is expected that the inter-bench walls will gradually ravel and deposit small rock-falls on benches. The accumulation of these small rock-falls will, over time, gradually produce talus slopes at an angle of repose for the material.

Some buildings and ancillary facility structures will remain after completion of the mining operations for use as part of the industrial PMLU, future mining PMLU, and long-term environmental monitoring required by the Arizona Aquifer Protection Permit (APP) program. Areas where buildings are removed will be reclaimed to eliminate hazardous conditions and achieve PMLU objectives.

2.1.2.4.2 Leach Pad. At closure, the leach pad will be allowed to drain to remove residual process solutions, consistent with APP requirements. To achieve the PMLU of wildlife habitat and limited grazing, the following measures will be implemented:

- In the course of operations, PDSI will construct stormwater diversions and management systems.
- The top surfaces of each of the last lifts of the leach pad will be graded after leach operations cease to direct the flow of stormwater to the center of the top lifts of the leach pad, where it will be collected to control infiltration (Figure 2-20). Designated ponding areas will be compacted and/or capped to minimize infiltration and enhance evaporative loss.
- Revegetation with native species will occur in discrete patches (microsites) that together will total approximately 20 percent[7] of the surface area of the top of the leach pad. Microsites will be distributed across the leach pad, including areas adjacent to designated ponding areas. This approach has been proposed to optimize the use of growth medium and to take advantage of favorable soil moisture conditions that result from regrading activities. The microsite areas will be capped with approximately 12 inches of Basin Fill sediment or comparable growth media and seeded with native species. It is anticipated that these areas will provide a seed source for adjacent areas which will be allowed to revegetate through natural colonization. PDSI will evaluate opportunities for salvaging state-protected plants such as barrel cactus as part of Project development activities. If plants are salvaged, their use as part of reclamation activities would also be evaluated.
- A test program will be undertaken concurrently with mine operation to determine the optimum method for reclamation of the leach pad side-slopes. To maintain an overall side-slope of 2H:1V, setbacks averaging approximately 20 feet wide will be made following the placement of approximately every second lift. The revegetation test program will involve rinsing the surface of the flat area of the setback and outer slope with fresh water to remove residual salts. Following rinsing, the flat area of the setback will be capped with approximately 12 inches of Basin Fill sediment or comparable growth medium and seeded with native species. A minimum of 12 inches of similar growth medium will be placed on the side-slopes of each lift and hydroseeded. This test program could potentially begin during Year 3 of the operation. Monitoring of the test program will determine optimum, concurrent reclamation methods, and optimum growth media thickness.

2.1.2.4.3 Development Rock Stockpiles. The following reclamation measures will be implemented to support the wildlife habitat and limited grazing PMLUs planned for the development rock stockpiles.

- In the course of operations, PDSI will construct stormwater diversions and management systems.
- The top surfaces of the development rock stockpiles will be graded during final placement of material to minimize random ponding and infiltration, to direct stormwater flows to compacted areas within the interior of the surface area for collection and evaporation, and to arrive at the final configuration. The top portions of slopes will be crown chained or dozed to stabilize slope faces.
- Revegetation with native species will occur in discrete patches (microsites) that together will total approximately 20 percent of the surface area of the top of the development rock stockpile. Microsites will be distributed across the development rock stockpile, including areas adjacent to designated ponding areas. This approach has been proposed to optimize the use of growth medium

[7] Neither BLM nor the State of Arizona has a minimum requirement for revegetation; 20% was arbitrarily selected as an adequate proportion of the pad to revegetate in the proposed manner.

and to take advantage of favorable soil moisture conditions that result from regrading activities. The microsite areas will be capped with approximately 12 inches of Basin Fill sediment or comparable growth media and seeded. These areas will provide a seed source for adjacent areas which will be allowed to revegetate through natural colonization. Growth medium will also be used extensively on the side-slopes of the stockpile for revegetation purposes. In addition, the stockpile slopes will be broadcast seeded, hydroseeded, or hydromulched. PDSI will evaluate opportunities for salvaging state-protected plants such as barrel cactus as part of Project development activities. If plants are salvaged, their use as part of reclamation activities would also be evaluated.

2.1.2.4.4 Open Pits. Revegetation of pit areas would interfere with potential future mining opportunities in the Mining District and is therefore not proposed. The open pit areas will be maintained for possible future access to mineral resources. Management of these areas will be in accordance with the PMLU of future mineral exploration and mine development in addition to education and tourism. Public access to the open pit areas may be allowed under controlled circumstances as part of the education and tourism PMLU objective. Visitor information center(s) will be developed to support tourism and to enhance awareness of mining and the history of the Mining District through educational displays.

Through time, a pit lake is expected to develop in each of the open pits. As documented in Chapter 4, water quality within the pit lakes is expected to be satisfactory and specific remedies or reclamation activities are not anticipated to be necessary.

2.1.2.4.5 Roads and Traffic. The post-reclamation configuration of roads has been designed to meet the access requirements for future industrial uses, education, and tourism uses, maintenance and security functions, and environmental monitoring. Roads that are retained as part of PMLU objectives will have public access controls (i.e., gates) for safety purposes, will be reduced in width as appropriate, and will be maintained in accordance with designated PMLUs. Approximately 160 acres of haul roads (excluding areas within the pits) and approximately 45 acres of new access roads will exist at the project site upon closure. Paved roads will be retained and maintained for long-term site access.

The following reclamation measures will be employed for access roads:

- For roads that are reclaimed, slopes on both sides of the roadway will be graded to blend in with the surrounding terrain. Where possible, drainages will be established to provide stable drainage conditions. Typical sediment barriers will be placed in accordance with BLM standards.

- After contouring and grading are completed, ripping of road surfaces and scarifying of the underlying materials will be performed to a depth ranging from one or two feet to reduce compaction and to prepare a seed bed. The prepared roadbeds will then be seeded with native species.

- Public access will be discouraged by the placement of earth berms, boulders, or gates at roadways around the site. Appropriate signage will be placed at all retained roads to provide warning of potential hazards associated with unauthorized access.

The following reclamation measures will be employed for haul roads:

- Haul roads will be reduced in width to allow two-way traffic of standard vehicles to access the former stockpile areas for PMLU management. Reclaimed portions of haul roads will be contoured and graded to control direct surface drainage. Safety berms that have been constructed will be retained along the outside edges of retained haul roads as necessary to ensure safety.

- After contouring and grading are completed, ripping of road surfaces and scarifying of the underlying materials will be performed to a depth ranging from one to two feet to reduce compaction and to allow for revegetation through natural colonization.

2.1.2.4.6 Reclamation Costs and Bonding. The estimated total cost to implement the proposed closure and reclamation measures is $7,978,000 (1997 dollars), which includes $1,311,000 in costs for closure requirements identified for PD's Aquifer Protection Permit and $6,667,000 in costs for reclamation measures (PDSI 1997). Ongoing maintenance costs during the period of reclamation will be funded through the 20 percent contingency added to the estimated total reclamation cost. These costs are summarized in Table 2-9.

Table 2-9. Projected Closure and Reclamation Cost Summary for the Dos Pobres/San Juan Project

Mine Facility	Projected Cost (1997$)
Leach Pad Surface	464,000
Leach Pad Slopes	1,463,000
Development Rock Stockpiles	601,000
Development Rock Stockpile Slopes	715,000
Process and Support Facilities	684,000
Haul and Access Roads	110,000
Open Pits	217,000
Support and Miscellaneous	455,000
Subtotal	**4,709,000**
Contingency @ 20% of Total Cost	942,000
Subtotal	**5,650,000**
BLM Administration @ 18%	1,017,000
Subtotal	**6,667,000**
APP Closure Costs	1,311,000
GRAND TOTAL	**$7,978,000**

Source: PDSI 1997

In consultation with BLM and the State Mine Inspector, PD will select an appropriate financial assurance mechanism(s) for reclamation costs. Potential financial assurance mechanisms include any one or a combination of the following: surety bond, certificate of deposit, trust fund with pay-in period, letter of credit, insurance policy, certificate of self-insurance, cash deposit with the state treasurer, evidence of ability to meet a corporate financial test or corporate guarantees per 40 CFR 264.143(f), or annuities.

2.1.2.5 Projected Employment

The Project will provide both short-term construction employment and long-term employment in the form of direct employment by PDSI, local contractor employment in direct support of project operations, and local indirect employment (jobs created or maintained as a result of direct employee needs for goods and services).

During the 15-month construction phase, employment is expected to average approximately 470 full-time workers, with peak employment reaching about 980 workers during the eighth month of construction. Table 2-10 summarizes estimated construction employment and payroll for this short-term phase of the Project.

Table 2-10. Estimated Employment and Payroll for the Construction Phase of the Project

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Total Employment (FT jobs)	150	220	400	450	570	800	890	980	960	600	320	270	220	170	50
Estimated Payroll ($000s)	538	789	1435	1614	2044	2869	3192	3515	3443	2152	1148	968	789	610	179

Source: PDSI 1996

For the operational phase of the Project (16 years), approximately 250 full-time employees, with an average annual per-capita salary of $36,000 (1997 dollars) plus benefits, will be employed annually by PDSI. It is expected that roughly 80 percent or more of the positions would be filled by applicants residing in the local Graham and Greenlee counties area, including some PD employees currently working at PD's Morenci Mine.

PDSI estimates that local contractors will employ approximately 100 people to provide direct support services for the Project. A portion of these contractors will work onsite at the Project while the remainder will provide certain maintenance and fabrication services out of local shops. Because of the Project's proximity to the San Carlos Apache Reservation, employment opportunities for tribal members will be available through both direct employment and through contractors that may be located on the reservation. Estimated total payrolls for local contractors working at or for the Project range from $2.5 to $3.0 million annually.

2.1.3 Partial Backfill of San Juan Alternative

This alternative to the Proposed Action was identified in the 404(b)(1) Alternatives Analysis (see Alternative C in Appendix A) as practicable, which is defined as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CRF §230.3[q]). This alternative would preclude development of additional leach ore resources at the San Juan pit assuming future conditions (economics, technology, etc.) would otherwise result in more economic reserves on the fringes of the currently planned pit. The mine plan for this alternative is described below and depicted in Figure 2-21.

2.1.3.1 Mining and Ore Processing Operations

This alternative is identical to the Proposed Action for mining production and pit configuration and sizing except that the portions of the San Juan pit would be partially backfilled with roughly 60 to 80 million tons of development rock from both the San Juan and Dos Pobres pits starting in Year 10 of the Project (see Figure 2-21). The backfilled development rock would be placed on the upper benches on the mined-out west side of the pit, starting at about the 3,650 ft elevation bench and rising to about 4,150 ft elevation in two lifts. The stockpile would ultimately cover roughly 141 acres in the pit. The ultimate pit lake elevation is projected at 3,450 ft elevation and is therefore not expected to contact the backfilled material (Water Management Consultants 1997). Placing a portion of the development rock in the San Juan pit, while not a usual and customary mining practice, would reduce the heights of the East and West development rock stockpiles by approximately 50 ft, to 4,200 and 4,100 feet above msl, respectively, with relatively minor reductions in the

footprints of the development rock stockpiles. Drilling and blasting procedures would be identical to the Proposed Action alternative.

This alternative does not propose backfilling of the Dos Pobres pit, as the distribution of oxide ore reserves and the known sulfide ore resource precludes full or partial backfilling at this pit. Therefore, the Partial Backfill alternative also proposes the 1,300-ft setback around the Dos Pobres pit to allow for potential future mining of deeper sulfide ore.

All ore processing facilities and operations, such as crushing, leach pad construction and operation, and SX/EW operations, would be identical to those described in the Proposed Action alternative.

2.1.3.2 Support and Ancillary Facilities

Support and ancillary facilities and operations, such as water supply, electrical power, compactible soil borrow source, shops, communications, transportation, access and haul roads, site security, powder magazine, and aggregate materials facilities, would be identical to those described in the Proposed Action alternative.

2.1.3.3 Environmental Protection Measures

Environmental protection measures involving wastewater treatment, surface water management, groundwater protection, solid waste and hazardous materials management, and air quality would be identical to those described in the Proposed Action alternative.

2.1.3.4 Closure and Reclamation Plan

The post-mining land uses for this alternative are the same as those proposed for the Proposed Action alternative. The closure and reclamation plan for this alternative would be similar to that described in the Proposed Action alternative. Development rock backfilled into the San Juan pit would be stabilized and reclaimed in a fashion similar to that proposed for the West and East development rock stockpiles. The closure and reclamation costs are expected to be the same as the Proposed Action alternative.

2.1.3.5 Projected Employment

The Partial Backfill alternative would require the same levels of direct and indirect employment as projected for the Proposed Action during the construction and operational phases of development. Backfilling of development rock into the San Juan pit would occur simultaneous with mining in other portions of the pit and is not anticipated to require additional haul trucks or employment.

2.1.4 No Action Alternative

The No Action alternative in this Mine Plan Alternatives Set would involve denying all federal actions being analyzed in this set: BLM would reject the proposed MPO and the Partial Backfill alternative; the COE would deny PDSI a Section 404 permit; and the EPA would deny PDSI an NPDES permit. The result would be no authorized MPO and no issuance of federal permits for mining activities subject to Sections 404 and 402 of the Clean Water Act. This alternative would effectively result in no mining at the Dos Pobres/San Juan Project.

The No Action alternative is a NEPA requirement that serves as a baseline for comparing and evaluating the environmental consequences of the Proposed Action and project alternatives. However, for the BLM,

the No Action alternative in this set directly conflicts with several federal laws under which the BLM administers public lands, including the General Mining Law of 1872, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; the Mining and Mineral Policy Act of 1970; and the National Materials and Minerals Policy, Research, and Development Act of 1980. These laws and regulations grant a mining claimant the rights to explore for, extract, and process in a reasonable manner the mineral resources on public lands for which he or she holds claims. In evaluating whether to approve an MPO, the BLM, as a public lands manager, has the responsibility under FLPMA and 43 CFR 3809 to ensure that:

- proposed mining operations include adequate provisions to prevent unnecessary and undue degradation of the environment (as defined in 43 CFR 3809.0-5[k]);
- measures are included to provide for reclamation of disturbed land; and
- proposed operations would comply with other applicable federal and state laws and regulation.

The BLM can thus disallow proposed mineral development activities on public lands *only* if the activities would violate applicable state and federal regulations and/or BLM standards. In such cases, BLM is required to indicate the changes in the proposed mining activities that would allow for approval of the plan. Under the current laws, however, BLM does not have the authority to deny an otherwise adequate or reasonable Mining Plan of Operations (i.e., select the No Action alternative).

2.1.5 Mine Plan Alternatives Eliminated from Further Consideration

2.1.5.1 Mine Plan Alternatives Considered in 404(b)(1) Alternatives Analysis

An analysis of alternatives is required by the COE under guidelines established under the Clean Water Act, Section 404(b)(1) (40 CFR 230). The objective of this analysis is to identify the least environmentally-damaging, most practicable alternative for the Project that avoids or minimizes impacts to waters of the U.S. A copy of the 404(b)(1) alternatives analysis completed for this project is provided in Appendix A.

A total of 15 alternatives or alternative mine plan components were considered in the alternatives analysis, including 9 alternative mine plan configurations, 2 site development sequence alternatives, 2 compactible soil borrow source alternatives, and 2 SX/EW location alternatives. Of the nine configuration alternatives and two site development sequence alternatives considered, only two alternative mine plan configurations (Alternative C, *Partial Backfill of San Juan Pit*, and Alternative I, *Single Leach Pad/Crush Convey w/ Haul Truck Placement* [the Proposed Action alternative]), were found to be practicable in light of cost, technical, and logistic considerations. These two alternatives were carried forth for further analysis in this EIS. The seven mine plan alternatives eliminated from further study were determined to be impracticable for logistic reasons and/or cost considerations (see Table 4 in Appendix A). These alternatives and the reasons for their elimination from further consideration are described in Appendix A.

The alternatives considered in the COE's 404(b)(1) Alternatives Analysis represent a reasonable range of mine plan alternatives that exist to achieve the Project's purpose and need and are technically capable of being accomplished. Considering the constraints imposed by the ore bodies, the distribution of other ore reserves in the project area, and the nature and distribution of waters of the U.S. in the project area, it is unlikely that other practicable alternatives that meet the purpose and need and that significantly minimize or avoid impacts to waters of the United States could be developed.

2.1.5.2 Alternative Mine Plan Elements Considered but Eliminated

Alternatives to some elements of the mining plan of operations were considered in preliminary planning and feasibility phases but eliminated from further analysis due to logistical or technical reasons. These alternative elements and the reason(s) for their elimination are described below.

2.1.5.2.1 Alternative SX/EW Plant Location. In the early planning phases of the Project, PD considered locating the SX/EW Plant in a central area with regard to PD's long-term potential development of their holdings within the Safford Mining District. Called the East SX/EW Plant, this site is located about 2.5 mi south-southeast of the San Juan pit in the east half of Section 13 (T6S, R26E) on PDSI's patented Lone Star property. The East SX/EW Plant would receive copper-laden pregnant leach solution (PLS) delivered through stainless steel and HDPE pipelines from the PLS collection tank at the toe of the leach pad. Plant feed and raffinate pipelines approximately four miles long would be constructed along a common corridor that would parallel the haul road to the Lone Star compactible clay borrow source. The pipeline system would be designed as a zero discharge system.

Given the time horizon for PD's long-term development plans at this time within the Safford Mining District, the uncertainties of environmental permitting, and the high capital and operating costs associated with the PLS and other pipelines to an East SX/EW Plant, this alternative was eliminated from further consideration at this time.

2.1.5.2.2 Alternative Supplemental Water Source. As a partial alternative to groundwater pumping, PDSI investigated the possibility of using treated effluent from the City of Safford as a supplemental source of process water for the Project. The City of Safford currently operates a wastewater treatment plant that processes about 738,000 gallons of effluent per day (J. Davies, Utilities Accountant, City of Safford, personal communication, 7/10/97). The treated wastewater is currently used to irrigate the City-owned golf course. Voters in the May 1997 bond election approved construction of a new plant that would be operational by late 1998 or early 1999 that could initially treat approximately 1.5 million gpd and roughly three million gpd at maximum capacity (ibid).

PDSI has not included the use of effluent in its current Project development plans because technical information is not available at this time regarding the compatibility of potentially available effluent with copper production processes. Furthermore, it has not been determined whether it is feasible or how to transport the effluent from the new plant to the project area. Without this information, no agreements can or have been made to purchase the City's effluent at this time. Since this alternative is not available at this time and may not be available in the future, it will not be considered further in this EIS, however, PD will reevaluate this option in the future as more data become available.

2.1.5.2.3 Off-Site Mine Alternative. PD considered two off-site mine alternatives in its 404(b)(1) Alternatives Analysis (see Appendix A): mining of the Sanchez orebody under the currently approved MPO (BLM 1992) and mining of the Lone Star ore deposit. The Sanchez Mine alternative was determined to be not practicable due to various technological considerations requiring the need for further evaluation of the current engineering design, metallurgical data, and economic potential. The Lone Star Mine alternative is not practicable at this time because of the limited information available upon which to prepare a mine plan and determine project feasibility. As geologic exploration studies to characterize the Lone Star ore body and its extent are still ongoing, this mine project is conceptual only.

2.2 LAND EXCHANGE ALTERNATIVES SET

Only the BLM can act on the alternatives presented in this set. Although PD's original proposed project was a land exchange and not an MPO, PD has extended the exchange proposal as an alternative to BLM authorizing the proposed MPO. By selecting a land exchange alternative, BLM would relinquish its jurisdiction over mining on public lands. Within this set of alternatives to the Project, one land exchange alternative has been identified by the BLM for detailed analysis.

Federal land exchange packages consist of public lands desired by the proponent (the selected lands) and private lands being offered to the federal agency in exchange (the offered lands). Land exchanges are discretionary and voluntary actions; that is, the BLM is not obligated to process every exchange proposal it receives (43 CFR §2200.0-6). Generally, BLM will respond to a land exchange proposal if it 1) conforms with the land tenure objectives of applicable BLM Resource Management Plans; and 2) has the potential to serve the public interest. The regulatory and realty considerations that circumscribe the range of reasonable land exchange alternatives that were developed and considered for this Project are briefly explained below.

2.2.1 Considerations in Formulating Land Exchange Alternatives

Several considerations played a role in BLM's development of land exchange alternatives. Among them are the public interest objectives and equal value requirements under FLPMA and FLEFA, BLM's resource management objectives, and constraints on the configuration of selected and offered lands from which to develop alternatives. These considerations as they shaped how land exchange alternatives were formulated for this Project, are briefly described below.

2.2.1.1 Equal Value

Federal Land Exchange Facilitation Act (FLEFA) and 43 CFR §2201.6 require that the lands being exchanged be of equal value, meaning that the monetary value of the offered and selected lands must be equal. To achieve this, any difference in monetary values, up to 25 percent of the value of the public lands leaving federal ownership (selected lands), must be equalized through a cash payment by the exchange proponent or by the agency. This requirement ensures that the exchange is fair, despite potential acreage differences, since not all land is worth the same dollar amount per acre.

2.2.1.2 Public Interest and Resource Values

That an exchange be in the public interest is a requirement under Federal Land Policy Management Act (FLPMA), FLEFA, and 43 CFR §2200.0-6. In considering whether an exchange is in the public interest, FLPMA directs the Secretary to "give full consideration to better Federal land management and the needs of State and local people, including needs for lands for the economy, community expansion, recreation, areas, food, fiber, minerals, and fish and wildlife..." (FLPMA Section 206[a]).

In addition, Section 206(a) of FLPMA also requires that the values of, and the management objectives served by, the lands being acquired (the offered lands) be greater than, or at least equal to, the values of and management objectives served by the public lands being disposed of (the selected lands). This means that the resource values of the lands the BLM would acquire be equal to or greater than the values of the lands leaving public ownership. In meeting the public interest requirement, the authorizing officer must generally determine that the values of the resources being exchanged are comparable or are in the public's favor in terms of quantity or quality.

2.2.1.3 Mutual Agreement on Configuration of Exchange Lands

Since federal land exchanges are discretionary, both the BLM and the exchange proponent must agree to the configuration of the selected and offered lands. The considerations affecting the configuration of selected and offered lands are briefly described below.

2.2.1.3.1 Selected Lands. Previous decisions by the Interior Board of Land Appeals (IBLA) have defined the range of alternative exchange configurations the BLM must consider. In *124 IBLA 44 (August 26, 1992)*, the IBLA determined that "in conducting an environmental review of a proposal to exchange public for private land, *BLM need not consider the alternative of conveying other land if it is not desired by the private party involved in the exchange and conveyance of such land would not satisfy the purpose of the exchange*" (emphasis added). Thus, the range of alternative selected lands is restricted to those configurations that are mutually acceptable to the exchange proponent and BLM.

2.2.1.3.2 Offered Lands. For this alternative set, any offered lands package had to meet one constraint: properties that PD originally offered to BLM in 1994 must be included as a "base package." At BLM's request, the base package was reduced from seven to five of the original properties to provide BLM more flexibility in considering and developing alternative offered lands packages. All five base properties are lands within Long-Term Management Areas (LTMAs) identified in the Safford District RMP, as amended and are high priority acquisition targets that meet the BLM's acquisition objectives as stated in the RMP. The five base properties have been appraised by BLM at $1,330,000 and are described in Section 2.2.3.

To develop offered lands packages that met BLM's resource value and land management objectives and that was within 25 percent of the dollar value of the selected lands, PD made nine additional offered properties available to BLM. These properties are located within areas administered by the Safford Field Office, as well as in other BLM field offices, and were identified by BLM as desirable for public ownership. The BLM members of the ID Team then developed and considered seven land exchange packages (see discussion of these alternatives in Section 2.2.4). Of these, BLM resource specialists identified one land exchange action alternative, which is described below in Section 2.2.2, as the most desirable alternative.

2.2.2 Land Exchange Alternative

Under this alternative, the BLM would dispose of about 17,000 acres of selected lands, both surface and mineral estate, north of Safford, including public lands containing the Sanchez office building. In exchange, BLM would acquire a total of 3,858 acres of private lands, both surface and mineral estate, comprised of five base package properties (2,135 acres) and six optional properties (1,723 acres). Table 2-11 summarizes the total acres and dollar values of the selected and offered lands.

Table 2-11. Summary of Estimated Acreage and Appraised Values of Selected and Offered Lands in the Land Exchange Alternative

	Selected Lands (Public Lands)	Offered Lands (Private Lands)	Difference/Discrepancy
Estimated Acreage	17,000 acres	3,858 acres	13,415 acres in favor of PD
Appraised Value	$4,034,500	$4,054,200	$19,700 in favor of BLM[8]

[8] The $19,700 discrepancy in dollar values represents 0.5 percent of the dollar value of the selected lands value, well within the 25 percent discrepancy allowed by FLEFA.

The exchange includes the transfer of all the rights and privileges, including surface water rights, that are appurtenant to the selected and offered lands and owned by the BLM and PD, respectively. The exchange of both selected and offered lands would be subject to existing rights-of-way and easement agreements; when those expire, the new landowner could decide whether or not to renew or renegotiate the agreement. Prior to the exchange, current grazing leases on both the selected and offered lands would be terminated, however, BLM would likely offer the current leasee first right of refusal for those offered properties acquired by BLM on which grazing will be allowed by the applicable resource management plan. Similarly, PD has indicated that if the exchange is authorized, it would renegotiate grazing leases with the current allottees for portions of the selected lands not directly involved in the proposed Dos Pobres/San Juan Project.

In developing this alternative, the BLM sought to maximize the management benefits and maintain a diversity in the resource values of lands that would come into federal ownership while minimizing the discrepancy in appraised dollar values between the selected and offered lands. Resource values associated with this offered lands package that would come into public ownership and federal management include, but are not limited to, riparian and wetland habitats; wildlife; threatened and endangered species habitats; cultural resources; recreation; public lands access to special management areas; and public land consolidation.

A description of the selected and offered lands and the foreseeable uses of the lands as identified by PDSI and applicable BLM land use and resource management plans, respectively, is provided below as required by 40 CFR 1508.7 and 1508.8. The foreseeable uses provide the context for analyzing the anticipated impacts of the land exchange alternative in Chapter 4.

2.2.2.1 Description and Foreseeable Uses of Exchange Lands

2.2.2.1.1 Selected Lands. PD has selected approximately 17,000 acres of BLM-administered public lands (selected lands) located north of Safford in Graham County in the Safford Mining District (see Figure 1-2) for exchange. The selected lands also include approximately 12 acres of public lands north of the town of Sanchez containing an approximately 6,500-square-foot office building constructed by the AZCO Mining Company for the Sanchez Mine project. The Sanchez parcel is located about eight miles southeast of the San Juan pit north of the Gila River. The selected lands are encumbered by 884 mining claims, approximately 95 percent (844) of which are held by PD; the remaining 40 claims are held by the Melody Claims Group. At this time, the Melody Claims cover about 453 acres and are included as part of the selected lands because PD is in the process of negotiating to buy these claims from its owners. If PD is unsuccessful in purchasing the claims, these lands will be dropped from the land exchange and would remain under BLM management. The patented Horseshoe Claims, a private inholding within the selected lands, are excluded from the exchange and would remain under their current land ownership. The appraised value of the selected lands is $4,034,500, which includes valuation of the Melody Claims and mineral potential of those portions of the San Juan deposit on public lands, among other resources. Photographs of the selected lands are provided in Figure 2-22; legal descriptions of these lands are provided in Appendix B.

2.2.2.1.2 Foreseeable Uses. The potential future uses of the lands after an exchange are referred to in this document as "foreseeable uses." The foreseeable uses of the selected lands can be differentiated into two general groups by their different stages of planning. The first group includes the specific mining and mining-related support activities described in detail under the Proposed Action alternative (see Figure 2-1) which would directly impact approximately 1,935 acres of the public lands selected for exchange. In addition, PDSI will continue to use the office building and other facilities located on the Sanchez parcel for

activities related to mining support, including mine process technology research[9]. These foreseeable uses would be implemented upon approval of the land exchange or MPO and all necessary permits.

The second group of foreseeable uses describes future mining or mining-related support activities that are still conceptual but anticipated for the potential future development of the Dos Pobres sulfide orebody and the Lone Star orebody (Figure 2-23). If future feasibility studies indicate that it is technically and economically feasible to do so and assuming all necessary permits and authorizations are secured for each project, PDSI anticipates that it could initiate mining of the Dos Pobres sulfide orebody and could start development of its Lone Star mine toward the end of the Dos Pobres/San Juan Project (PDSI 1996). At this time, PDSI has developed only preliminary conceptual plans for development of the sulfide ore body and the Lone Star deposit based on the limited exploratory and geological data collected to date. These conceptual plans include three kinds of foreseeable uses for the selected lands that would be involved in these potential projects: production operations and support areas; transition areas; and intermittent use areas. The kinds of activities anticipated for each of these foreseeable use categories are described below and the approximate acreage each category comprises are summarized in Table 2-12.

Table 2-12. Approximate Acreage in Foreseeable Use Categories by Land Ownership

Land Ownership	Dos Pobres Sulfide		Lone Star		Intermittent	SUB-TOTAL	DP/SJ Project	TOTAL
	POS	Trans.	POS	Trans.				
BLM	613	133	1,100	231	12,921	**14,008**	1,935	**15,943**
PD Private	2,788	459	4,735	292	9,836	**18,110**	1,387	**19,497**
State	46	30	0	0	234	**310**	10	**320**
TOTAL	**3,447**	**622**	**5,835**	**523**	**22,991**	**32,428**	**3,332**	**36,760**

- **Production Operations and Support Areas (POS).** Anticipated mining activities in this area include open pit mining; crushing, leach pad and development rock stockpiling; tailings impoundment development; soil stockpiling; mining support activities (shops, plants, etc.); facilities in this area would include haul roads; borrow areas; and processing facilities like an SX/EW plant and/or concentrator. Potential surface disturbance could affect 26 to 100 percent of the land within this foreseeable use category. This category comprises 1,713 acres of the selected lands.
- **Transitional Areas.** This area was arbitrarily set as a 100-yard-wide safety buffer zone surrounding Production Operations and Support areas. Foreseeable uses in Transition Areas include access roads, safety berms, and run-out areas for stockpiles. Together, transitional areas for both potential projects would impact about 364 acres of the selected lands, of which approximately six to 25 percent of the land surface within this use category would be disturbed by these activities.
- **Intermittent Use Areas.** This area includes all other public lands in the project area that would not be developed for the Dos Pobres/San Juan Project and not identified as Production Operations and Support Areas or Transition Areas. This area comprises roughly 12,921 acres (76 percent) of the selected lands. Potential primary uses of this area include environmental monitoring and spatial buffers between production facilities and project area boundaries for maintenance of site security.

[9] PDSI is conducting these activities at the Sanchez parcel under the authorization of the approved Sanchez Copper Project Mine Plan of Operations (BLM 1992).

Use of the former administration building on the Sanchez parcel for ongoing mine support and technology research is included in this category (BLM 1992). Anticipated levels of surface disturbance within the Intermittent Use area range from zero to five percent of the land surface.

2.2.2.1.3 Offered Lands and Their Foreseeable Uses. The total offered lands package consists of 11 private properties totaling 3,858 acres. Figure 2-24 shows the regional locations of the offered lands within the state. The base properties are the Amado, Curtis, Musnicki, Schock, and Feulner properties, which total 2,135 acres. The remaining six properties included in the package consist of Tavasci Marsh, Freeland, Butler-Borg, Norton, Clyne I, and Clyne II properties, which total 1,723 acres. Together, the 11 properties have been appraised at $4,054,200. Photographs of the offered properties are provided in Figures 2-25 and 2-26. Each property and its foreseeable use per applicable federal management/land use plans are briefly described below; legal descriptions are provided in Appendix B. More detailed information about the resources of each property is provided in Chapter 3, the Affected Environment.

- **Amado property.** This 180-acre property held in two tracts is located on Bonita Creek within the boundaries of the Gila Box Riparian National Conservation Area (RNCA) in Graham County (Figure 2-27). Both tracts straddle Bonita Creek. This property is one of 15 remaining private inholdings in the Gila Box RNCA. The property is currently leased for grazing; no residential improvements or other structures have been built on the property. The southerly tract abuts the Curtis property.

  If acquired by the BLM, the entire Amado property would be incorporated into the Gila Box RNCA, as it lies within the Congressionally-approved boundary. This property would be managed in a manner consistent with the management prescriptions described in the Final Gila Box Management Plan (BLM 1998). As stated in the Final Plan, general management objectives for the Gila Box RNCA, which was designated by Congress under the Arizona Desert Wilderness Act of 1990, Title II, are to conserve, protect and enhance its riparian areas and associated resources. Currently, the Gila Box RNCA is withdrawn from mineral entry and lies within the BLM's Safford Field Office's administrative boundaries.

- **Curtis property.** This 755-acre property, also held in two tracts, is located on Bonita Creek. All but approximately 80 acres of the southern tract lie within the Congressionally-approved boundaries of the Gila Box RNCA in Graham County. Both tracts straddle Bonita Creek and are located just downstream of the Amado property (Figure 2-27). The northern tract of the Curtis property includes a five-acre area that is excluded from the proposed exchange; the landowner that PD bought this property from has retained this five-acre exclusion area as private land. The Curtis property is one of 15 remaining private inholdings within the Gila Box RNCA. The property is currently leased for grazing and contains some range improvements; no residential improvements or other structures have been built on the property.

  If acquired by the BLM, 675 acres of the 755-acre Curtis property would be incorporated into the Gila Box RNCA and would be managed in a manner consistent with the management prescriptions described in the Final Gila Box Management Plan (BLM 1998). As stated in the Final Plan, general management objectives for the Gila Box RNCA, which was designated by Congress under the Arizona Desert Wilderness Act of 1990, Title II, are to conserve, protect and enhance its riparian areas and associated resources. Currently, the Gila Box RNCA is withdrawn from mineral entry and lies within the BLM's Safford Field Office boundaries. The remaining 80-acre portion of the Curtis property, which is not within the Gila Box RNCA boundary but directly adjacent to it, would be managed according to the decisions in the Safford District RMP, as amended, which call for multiple use including but not limited to livestock grazing, wildlife habitat, dispersed recreation, public access, and mineral entry.

- **Musnicki property.** This 640-acre property abuts the northeast boundary of the Dos Cabezas Mountains Wilderness in Cochise County (Figure 2-28); to its north lies the Peterson property, which has been offered to BLM as part of the Morenci Land Exchange (BLM 1996). The property includes the abandoned Musnicki ranch house, the former headquarters of the Nine-Mile Ranch. This property is currently leased for grazing.

  If acquired by the BLM, this property would help to consolidate BLM holdings in the Dos Cabezas Long-Term Management Area (LTMA) and improve public access to the Dos Cabezas Mountains Wilderness, especially to the central portion of the Wilderness. The property would be managed according to the decisions in Safford District RMP, as amended, which states that lands within the LTMA are to be managed for their multiple resource values as defined in FLPMA. General management objectives for other BLM lands in the Dos Cabezas LTMA include livestock grazing, recreation, wildlife habitat, mineral entry, and other uses. Off-highway vehicle use would be limited to existing roads and trails. The existing Musnicki Ranch House would left intact but not specially managed. This property would be administered by the Safford Field Office.

- **Schock property.** This 240-acre property is located in Santa Cruz County, east of Sonoita at the base of Mt. Bruce at the northern end of the Mustang Mountains (Figure 2-29). The property lies within the BLM's Empire-Cienega Long-Term Management Area (LTMA). The property is currently grazed; no residential improvements or other structures have been built on the property.

  If acquired by the BLM, this property would be administered by the BLM's Tucson Field Office and managed per the objectives for the Empire-Cienega Ranches Interim Guidance in the Phoenix District RMP and the Safford District RMP, as amended. The property would be intensively managed for its multiple resource values, such as recreation, grazing, wildlife habitat, and other uses. BLM must decide within 90-days of acquiring this property whether the property would be open to mineral entry. Off-highway vehicle use of this property would be limited to existing roads and trails.

- **Feulner property.** This 320-acre property is located in Pima County about one mile east of Cienega Creek in the BLM's Empire-Cienega LTMA. The property straddles an unnamed drainage that is tributary to Cienega Creek (Figure 2-30). The property is currently leased for grazing; no residential improvements or other structures have been built on the property.

  The foreseeable use of this property under the land exchange alternative would be identical to the management described for the Schock property.

- **Tavasci Marsh property.** This property consists of approximately 324 acres in sections 15 and 22 of Township 16 North, Range 3 East, near Clarkdale, in Yavapai County, Arizona. The offered property is the site of the Tavasci Marsh Habitat Restoration Project, a cooperative effort between Phelps Dodge Corporation and the Arizona Game and Fish Department. The property, which includes Tavasci Marsh and some surrounding uplands (Figure 2-31), is not grazed and is currently managed by AGFD under a cooperative management agreement with Phelps Dodge for public recreation, fish, wildlife, and wetland habitat (Phelps Dodge Corporation and Arizona Game and Fish Commission 1990--Agreement and Amendment of Agreement for Show Low Lake and Tavasci and Packard Ranch Riparian Areas). The property actually lies within the Congressionally-approved boundary of the Tuzigoot National Monument (Section 3.3.2.1.1 provides an explanation of the relationship of this property to the existing Monument boundary) and is adjacent to the Tuzigoot Pueblo ruins.

If acquired in the exchange, the National Park Service (NPS), which administers the Tuzigoot National Monument, would manage the Tavasci Marsh property. The NPS would continue to follow the management objectives set forth in an existing Cooperative Management Agreement signed by PD and AGFD (G. Henderson, NPS, personal communication, July 10, 1997) but may also undertake other management actions consistent with the *Tuzigoot Statement for Management* (NPS 1995). One of the objectives of the Monument's management plan is to acquire the Tavasci Marsh property since it "currently separates the Monument from Dead Horse Ranch State Park [which] precludes joint development for public use of the Marsh" (NPS 1995:13). The following general management objectives would apply to the Tavasci Marsh property: preserve the historic and prehistoric integrity of the Monument and surrounding lands, maintain the environmental integrity of the Monument, and retain the native vegetative community (NPS 1995).

- **Freeland property.** This property consists of three separate tracts (West, North, and East) totaling 140 acres north of the Dos Cabezas Mountains Wilderness in Cochise County (Figure 2-32). The West tract is 20 acres in size and is adjacent to the Stewart Trust property, which has been offered to BLM as part of the Morenci Land Exchange (BLM 1996). The North tract is 80 acres, and the East tract is 40 acres. The property is currently leased for grazing and contains no residential structures.

  Foreseeable management and authorized uses of this property under this alternative would be identical to that described for the Musnicki property.

- **Butler-Borg property.** This 308-acre property abuts the boundary of the Dos Cabezas Mountains Wilderness in Cochise County (Figure 2-32). Although located outside of the Wilderness, this property, together with the Freeland West tract and the Stewart Trust property included in the Morenci Land Exchange, provide public and physical access to the central part of the Wilderness. If acquired, this property would help consolidate BLM holdings in the Dos Cabezas LTMA. The property is currently leased for grazing and contains no residential structures.

  Foreseeable management and authorized uses of this property under the land exchange alternative would be identical to that described for the Musnicki property.

- **Norton property.** This 391-acre property is held in two tracts and is located within the floodplain of Black Rock Wash in Graham County (Figure 2-33). Formerly part of the Norton family ranch, these tracts are surrounded by BLM-administered lands, are currently leased for grazing, but do not contain any residential structures.

  If acquired through the exchange, BLM's Safford Field Office would manage this property per the Safford District RMP, as amended. Current management objectives for the Southwest Gila Valley LTMA include public access, livestock grazing, wildlife, mineral entry, and dispersed recreation.

- **Clyne I property.** This 160-acre property is located in Pima County within the Tucson Field Office's Empire-Cienega LTMA (Figure 2-34). Formerly part of a 240-acre property originally offered for the Morenci Land Exchange, this 160-acre portion (SW1/4, section 10, T19S, R18E) was excluded from that exchange in order to reduce the Morenci offered lands values to match those of the selected lands. PD has made this remaining 160-acre portion of the property available for this land exchange alternative. The Clyne I property straddles the middle portions of Bear Spring Canyon below Blacktail Spring and is currently leased for grazing. The property contains no residential structures.

  The foreseeable use of this property would be identical to the management described for the Schock property.

- **Clyne II property.** This 400-acre property is located in Pima County approximately 0.75-mile south of the Clyne I property and straddles Mud Spring Canyon (Figure 2-34). A large unnamed stocktank lies in the southwest corner of the property within Mud Spring Canyon. The property is currently leased for grazing and is not encumbered by any residential or other leases; it contains no residential structures.

  The foreseeable use of this property would be identical to the management described for the Schock property.

2.2.3 No Land Exchange Alternative

This is the second alternative in the Land Exchange Alternatives Set and involves BLM rejecting the exchange and retaining the selected lands under public ownership and federal management. Likewise, the offered lands would remain in PD's private ownership and the public would not acquire any of the resources associated with those properties.

Retaining the selected lands under BLM administration would result in a requirement for further BLM action on whether to authorize the proposed MPO or another alternative or select the No Action alternative in the Mine Plan Alternatives Set. Under this alternative, impacts to the human environment are expected to be the same as those described under either the Proposed Action alternative or the Partial Backfill alternative. This conclusion is based on the following: 1) PDSI has submitted a Mining Plan of Operations (MPO) to the BLM for consideration, and 2) under 43 CFR 3809, the BLM must authorize any mining plan that: a) includes adequate provisions to prevent unnecessary and undue degradation of the environment; b) includes measures to provide for reclamation of disturbed land, and; c) complies with other applicable federal and state laws and regulations. It is reasonable to assume that, since the submitted MPO and the Partial Backfill alternative are also being evaluated by the COE and EPA as part of Clean Water Act permitting, that these alternatives or some modification of either will fulfill these three requirements. Therefore, it is reasonable to assume that mining activities would proceed on portions of the selected lands whether the proposed land exchange is approved or not.

2.2.4 Land Exchange Alternatives Considered but Eliminated

BLM developed and considered other alternatives to the proposed land exchange alternative discussed above, including alternative methods of acquiring the offered lands. This section briefly describes these alternatives and provides BLM's rationale for not considering them further.

2.2.4.1 Alternative Configurations of Selected and Offered Lands

The range of exchange alternatives is limited by the exchange process itself, which requires that the dollar values of the selected and offered lands be equal.[10] Because land exchanges are discretionary actions, the BLM goes forward with an analysis of the exchange proposal only when the package of lands is mutually agreeable to both parties. The exchange alternative considered and analyzed in this EIS reflects offered and selected land packages mutually agreed upon by the BLM and PD.

No alternative selected lands configurations were considered because the selected lands are heavily encumbered by PD-owned mining claims; have been identified for disposal in the Safford District RMP, as

[10] An exchange is considered to be of equal monetary value if the cash value of the offered lands is within 25 percent of the cash value of the selected lands (FLPMA, 90 Stat.2756, 43 USC 1716 §206[b]). Discrepancies up to 25 percent are then equalized by a cash payment to make up the difference.

amended; and the proposed land ownership boundaries would simplify the current public and private land ownership pattern.

To arrive at mutually agreed upon land exchange alternatives, BLM undertook a process to develop and evaluate various alternative offered lands packages within the constraints of the five base and nine optional offered properties. BLM developed seven alternative offered lands packages that represent a reasonable range of alternatives which had the potential to meet the public interest requirement of FLPMA and were within the 25 percent allowable discrepancy in dollar values between the selected lands and offered lands (base plus optional) packages. The BLM members of the Interdisciplinary Team then ranked each alternative from 1 to 7 (1 being most preferred; 7 being least preferred) based on resource values that would be acquired and resource management considerations. Individual rankings were then summed to become a "score" for each alternative. The lower the total score, the more preferable the alternative to the ID Team. Based on this total score, a single alternative, Alternative 6, clearly stood out from all other land exchange alternatives as the one most preferred by the BLM members of the ID Team from a resource and management perspective. BLM determined that only this alternative would be carried forth for analysis. Alternative 6 is the land exchange alternative described in Section 2.2.5 and includes six of the nine optional offered lands, in addition to the five base properties.

The seven land exchange alternatives developed by the BLM, their individual total scores, and their acreage and appraised values are summarized in Table 2-13. The three optional offered properties which were not included in the land exchange alternative (Lehner Ranch, Davison, and Lincoln Ranch) are described in Appendix E, along with a brief description of BLM's foreseeable uses had they been included in a land exchange alternative preferred by the BLM.

2.2.4.2 Alternative Land Tenure Adjustment Methods

Alternative methods of adjusting federal land ownership, such as direct purchase/sale or acquisition by donation instead of a land exchange, were considered by BLM but eliminated from further consideration. Section 203 of FLPMA provides for sales of public land by competitive bidding, by modified competition, or direct sale with no competition. All sales must comply with at least one of the following sale criteria as stated in Section 203 of FLPMA: "1) difficult or uneconomic to manage, 2) needed for an important public objective, or 3) acquired for a specific purpose and no longer needed for that purpose." The Safford District RMP, as amended, states that disposal of federal land by exchange is the preferred method. Because the disposal of the selected lands by sale may not fall under one of these three criteria and because exchange is the BLM's preferred method of disposal, a sale was not considered further. Furthermore, the BLM's ability to buy the offered lands directly is limited by budget constraints, and funds for purchasing all but one the offered lands are not available at this time nor will be in the foreseeable future.[11] Acquisition of the offered lands by donation was eliminated from further consideration since PD has not proposed this and wishes to receive lands of equal value to those they propose to convey to the BLM.

[11] The only offered property that is currently authorized for purchase using LWCF monies is the Lehner property, which lies within the San Pedro RNCA.

Table 2-13. Summary of Seven Land Exchange Alternatives Formulated for the Dos Pobres/San Juan Project

All alternatives include the base package of lands plus the optional properties identified in column 2. Negative amounts in parentheses for Dollar Discrepancy column mean the value of offered lands is greater than value of selected lands and BLM would owe PD (or PD has the option to donate this amount). Rank is the cumulative score given by BLM ID Team members; the lower the score, the more the BLM preferred the alternative.

Codes for resource values are: rip=riparian, wet=wetlands, t&e=listed species, rec=recreation, con=consolidation, wsr=Wild & Scenic Rivers, pw=perennial water, sprnca= San Pedro rnca, tuzigootnm=Tuzigoot National Monument, dcmw=Dos Cabezas Mountains Wilderness, ecrca=Empire-Cienega RCA, rawhidemw=Rawhide Mountains Wilderness

Alternative	Optional Properties Included in Alternative	Total Acres (Base + Optional)	Total Appraised Value (Base + Optional)	Dollar Discrepancy w/Selected Lands	Percent Discrepancy	Associated Resource Values (excluding base package lands)	Total Score/ Rank
Alt 1	Tavasci, Lehner, Clyne I, Freeland, Butler-Borg, Norton	3,235	$4,041,200	($6,700)	-0.2%	rip, wet, t&e, sprnca, access, tuzigootnm, rec, ecrca, con	42
Alt 2	Tavasci, Lehner, Clyne I, Clyne II, Norton	3,470	$4,021,000	$13,500	0.3%	rip, wet, t&e, sprnca, ecrca, rec, con, pw, tuzigootnm	43
Alt 3	Tavasci, Lehner, Clyne I, Clyne II, Freeland	3,387	$4,015,000	$19,500	0.5%	rip, wet, t&e, sprnca, ecrca, access, tuzigootnm, rec, con	31
Alt 4	Tavasci, Lehner, Clyne II, Freeland, Butler-Borg, Norton	3,758	$3,984,200	$50,300	1.2%	rip, wet, t&e, sprnca, pw, access, rec, con, ecrca, dcmw, tuzigootnm	27
Alt 5	Tavasci, Clyne I, Freeland, Butler-Borg, Davison	3,495	$4,017,200	$17,300	0.4%	rip, wet, t&e, rec, con, pw, access, dcmw, ecrca, tuzigootnm	40
Alt 6	Tavasci, Clyne I, Clyne II, Freeland, Butler-Borg, Norton	3,858	$4,054,200	($19,700)	-0.5%	rip, wet, t&e, rec, con, pw, access, dcmw, ecrca, tuzigootnm	14
Alt 7	Tavasci, Lincoln, Clyne II	3,861	$4,185,000	($150,500)	-3.7%	rip, wet, t&e, rec, con, pw, wsr, rawhidemw, ecrca, tuzigootnm	55

2.3 PREFERRED ALTERNATIVE

The BLM's preferred alternative is the land exchange alternative. This alternative would allow the BLM to achieve its objectives for public lands management and land tenure adjustments as stated in the Safford District RMP, as amended, while still meeting the purpose and need for the proposed Dos Pobres/San Juan Project. Under this alternative, federal oversight of the Project is still provided by the COE's and EPA's direct involvement; the State Mine Inspector's Office would take jurisdiction over reclamation of the mined private lands. Although the selected lands would become privately owned by PD under this alternative, potential future mining projects on these lands would still be subject to COE and/or EPA's federal jurisdiction through their respective permitting authorities under the Clean Water Act. Furthermore, other federal laws such as the Clean Air Act would also likely trigger federal involvement in such future activities.

The COE, as a cooperating agency, will select the least environmentally damaging, practicable alternative as its preferred alternative. The EPA, also a cooperating agency, will select the alternative which causes the least damage to the biological and physical environment, and which best protects, preserves, and enhances historic, cultural, and natural resources. While the EPA generally identifies the No Action alternative as the environmentally preferable alternative, EPA may also select an environmentally preferable action alternative.

2.4 COMPARATIVE SUMMARY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

Table 2-14 concisely summarizes each alternative's direct, indirect, and cumulative impacts for the issues raised during scoping and for critical elements whose consideration is required by BLM NEPA guidelines. Like Chapter 4, the information in Table 2-14 is organized into two alternative sets: the Mine Plan Alternatives Set and the Land Exchange Alternatives Set. Both sets include separate "no action" alternatives (the No Action alternative and the No Land Exchange alternative) as well as the action alternatives. The basis for this summary is the analysis of direct, indirect, and cumulative impacts presented in Chapter 4.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

LAND USE

Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Public Lands Management	No direct, indirect, or cumulative impacts to management of public lands. The status quo would be maintained.	BLM oversight and compliance monitoring of MPO and reclamation would require administrative efforts that would increase the long-term administrative costs of managing public lands (beyond reclamation). PMLUs would return portions of the MPO area for limited public use (i.e., dispersed recreation, grazing) that would be managed by BLM.	Direct and indirect impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts are expected to result from this alternative. Continuation of complex land ownership patterns and associated difficulties for managing public lands. Potential continues for patenting of some areas by MPO should Congress lift moritorium on second stage patenting mining claims on public lands.	Management efficiency expected to improve with disposal of 17,000 acres of public lands encumbered by PD mining claims and interspersed with private land holdings. State Mine Inspector and not BLM would be responsible for reclamation oversight; federal oversight of mining still provided through CWA permitting by COE/EPA and through MSHA. Land disposal facilitates public lands management objectives in the Safford Field Office and releases BLM (but not all federal agencies) from future management responsibilities for foreseeable mining uses at DP Sulfide and Lone Star projects. Impacts of foreseeable uses expected to be identical to those described under Proposed Action.	Public acquires 3,858 ac of private lands in one RNCA, two LTMAs, and one RCA administered by BLM, and in one NPS National Monument in Arizona. BLM achieves increased public lands consolidation in Gila Box RNCA, Dos Cabezas LTMA, Southwest Gila Valley LTMA, Empire-Cienega RCA, and Tuzigoot NM; this alternative would facilitate public lands management and tenure objectives of both BLM and NPS.
Access/Recreation	No direct, indirect, or cumulative impacts to access to and recreation on public lands. The status quo would be maintained.	Public access on San Juan Mine Road would be discontinued; Johnny Creek Ride permit could not include public lands used for mining for public safety and site security concerns; five existing BLM special use permits would be modified to exclude use of mining areas; public lands available for hunting in AGFD Hunt Unit 28 reduced by about 5,169 acres (acreage that will be fenced off around Project).	Direct and indirect impacts are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts are expected to result from this alternative.	In disposing of selected lands, physical and public access to and dispersed recreation on the selected lands would no longer be controlled by BLM, but by PDSI. BLM would retain access on portions of on Solomon Pass Rd, Salt Tank Trap Rd, West Ranch Rd for continued public and physical access through PD lands to Gila Mountains and Gila Box RNCA. Owners of Horseshoe Claims would have access to their lands through BLM easement on spur road from Solomon Pass Rd. Foreseeable uses at DP/SJ Project would result in same impacts to public access and recreation as the Proposed Action. Foreseeable mining uses at DP sulfide and Lone Star projects would not be expected to further affect dispersed recreation opportunities or public access than those effects described above.	Through acquisition of offered lands, public access to the Dos Cabezas Mountains Wilderness, in the Gila Box RNCA, and in the Empire-Cienega RCA would be improved. Developed recreational facilities at Tavasci Marsh come into public ownership and management; dispersed recreational opportunities would be increased in BLM Safford and Tucson Field Offices.
Encumbrances	No direct, indirect, or cumulative impacts on existing rights-of-way or easements on public lands.	Seven ROWs are directly impacted by proposed mining and would be relocated to provide utilities to the Project. This is not expected to be an adverse impact as existing ROWs are for utilities to current or past mining operators.	Direct and indirect impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts expected to result from this alternative.	No direct, indirect, or cumulative impacts to encumbrances on the selected lands as disposal of 17,000 acres of selected lands would be subject to conditions of existing ROWs. Physical impacts from foreseeable uses would be identical to those described under the Proposed Action, but these are not expected to be adverse.	No direct, indirect, or cumulative impacts to existing encumbrances on offered lands as exchange is "subject to" conditions of existing legal agreements appurtenant to the lands.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

LAND USE

Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Agriculture/Grazing	No direct, indirect, or cumulative impacts to prime farmlands or to grazing are expected.	No direct impacts to agricultural lands, but minor indirect, long-term impacts to agricultural production through implementation of alternate year fallow program for water resources mitigation (see Appendix F). Eight range improvements within four allotments, comprising a total of 5,169 acres of public lands would be directly impacted by proposed mining as these resources would be fenced off for security and safety purposes. BLM's grazing receipts reduced by about $144/yr resulting from 107 AUM reduction in BLM stocking capacity within the allotments affected by this alternative.	Direct and indirect impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts are expected as a result of this alternative.	No direct, indirect, or cumulative impacts to agricultural lands. Disposal of the selected lands would adversely and directly impact nearly 17,000 acres of public lands in 6 BLM allotments, totaling 653 AUMs. This would reduce BLM grazing receipts by nearly $882/yr and impact 24 range improvements. In the short-term, some grazing use of the selected lands outside the proposed security fence would occur, as PD would lease back a portion of the selected lands until such time as other foreseeable uses at the DP sulfide and Lone Star projects were implemented. At that time, PD would likely terminate grazing use on additional, but unknown areas within the selected lands in order to develop these projects. The maximum total physical impacts by foreseeable uses would be about 10,431 acres. The majority of intermittent uses areas could still be grazed, but PD would own the land and receive the annual grazing income.	Acquisition of offered lands and the availability of those lands for grazing (except Tavasci Marsh and riparian areas of Amado and Curtis) would offset slightly the loss of public grazing use of selected lands. Foreseeable uses of the offered land under public management would not affect agricultural uses or productivity.
Mineral Rights	No direct, indirect, or cumulative impacts to mineral rights on public lands are expected. This alternative would not affect PD's right to mine its claims under a permittable MPO.	No direct, indirect, or cumulative impacts to PD's or third-parties' mineral rights on public lands are expected.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts are expected as a result of this alternative.	No direct, indirect, or cumulative impacts to PD's or third-parties' mineral rights on the selected lands from either the exchange or the foreseeable uses of the selected lands. Exchange of 453 acres of Melody Claims lands would be subject to successful negotiations with claim owners prior to BLM's ROD.	PD would relinquish right to extract minerals on offered lands. Public acquires right to extract mineral resources on Norton, Musnicki, Freeland, and Butler-Borg properties per applicable management plans. All other properties would be withdrawn from mineral entry if acquired through the exchange.
Surface Water Rights	No direct, indirect, or cumulative impacts to surface water rights appurtenant to public lands.	Physical impacts to 17 surface water rights totaling 66.85 af/yr on public lands within mine plan and security fence footprint; physical impacts to 4 surface water rights totaling 75.97 af/yr on PD land. No impacts to Indian or other water rights to Gila River as mitigation for surface water quantity impacts preclude such impacts (see Surface Water Quantity discussion under Physical Resources in this Table).	Direct and indirect impacts are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts expected as a result of this alternative.	BLM would relinquish 14 of its registered water rights for a total of 137.1 af/yr appurtenant to the selected lands. The exchange would not affect ownership of 21 non-BLM water rights on selected lands but may affect access by holders to use of such rights. Ownership of, access to, or use of water rights outside the foreseeable use areas for the DP/SJ Project would not be impacted. Implementing foreseeable uses would have the same impacts on surface water rights as those described for the Proposed Action. Future potential development of the DP sulfide project would not cause additional impacts to surface water rights beyond those incurred by the DP/SJ Project; however, Production Operations and Support and Transitional Use areas identified for the Lone Star project would directly impact 5 surface water rights totaling 28.31 af/yr. Use of water rights in Intermittent Use areas unlikely to be impacted.	BLM would lose 136 af/yr of registered surface water rights in the Gila River watershed, but, overall, the public domain would gain nearly 693 af/yr surface water rights.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

LAND USE						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Blasting Noise/ Vibrations	No direct, indirect, or cumulative impacts to existing levels of noise and vibrations in the region from this alterative because no blasting would occur.	In Safford, daily short-duration noise and vibration impacts from mine blasts would not reach levels commonly considered to be annoying; these impacts would last the life of the Project. The effects will be almost imperceptible at Mt. Graham and are not likely to affect observation activities.	Direct and indirect impacts are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts expected as a result of this alternative.	No impacts on existing noise and vibration levels in Safford as a result of the land exchange itself. The foreseeable mining at the DP/SJ Project would have impacts identical to those described under the Proposed Action. Additional noise and vibrations generated by the foreseeable uses at the DP sulfide and Lone Star projects would be similar in magnitude to those of the Proposed Action alternative, but the number of blasts may vary slightly.	No direct, indirect, or cumulative impacts to existing noise and vibration levels on the offered lands are expected as a result of the exchange.
Visual Resources	No direct, indirect, or cumulative impacts to public lands visual resources. The visual character of the area would be retained.	Visual character of the landscape will be modified in a major way permanently, primarily through creation of changes in topography and contrasting land forms, lines, and contrasting colors of disturbed areas with undisturbed areas. Visual impacts from in-town views probably will be less noticeable as compared to views from above or near the higher elevations of the Gila Mtns. Nighttime lighting in the project area will be a long-term effect but is not expected to impact operations at Mt. Graham as PDSI must comply with Graham County Nighttime Lighting Ordinance.	For in-town views of the project area, this alternative will result in similar but slightly reduced direct visual resource impacts as a result of slightly lower stockpile heights. Nighttime lighting impacts may also be slightly reduced due to portable light plants located below surface elevation in the San Juan pit for the latter part of the Project. Otherwise all impacts would be identical to those described for the Proposed Action.	No direct, indirect, or cumulative impacts are expected as a result of this alternative.	In disposing of the selected lands, BLM VRM objectives for those lands would no longer apply. The foreseeable mining uses could be implemented without BLM input on visual mitigation measures. Foreseeable uses at the DP/SJ Project would result in impacts identical to those described for the Proposed Action alternative. Foreseeable uses at Dos Pobres sulfide and Lone Star projects would extend those impacts, adding to cumulative visual impacts in the Safford Valley. Together, the foreseeable mining uses would alter the landscape of the Gila Mountains and its southern flank, affecting the silhouette of Lone Star Mountain. The massing effect of the three mines across the base of the mountains would create a zone below the horizon of large-scale, mesa-like or terrace-like forms, with various structures, roads, and contrasting colors visible.	Offered lands would become subject to public management of visual resources per VRM objectives for adjacent public lands as stated in the applicable management plan.
Hazardous Materials	No direct, indirect, or cumulative impacts expected from hazardous materials as a result of this alternative. The zipACIDS site would remain and no additional hazardous material would be brought on site.	There would be a beneficial effect from elimination of the San Juan zipACIDS site as a result of the Project. Through environmental compliance with MSHA, OSHA, RCRA, EPCRA and other regulations for hazardous materials, all regulated materials are expected to be transported, handled, stored, and disposed of properly; however, a risk of environmental damage is incurred by the transport of such materials and their presence on site (due to human error, etc). As part of closure and reclamation, many facilities would be razed and materials disposed of at an authorized waste disposal site.	Direct and indirect impacts are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts expected as a result of this alterative.	Disposal of the selected lands would reduce federal liabilities for any hazardous materials associated with mined lands. In implementing the foreseeable uses on private lands, PD, as the new landowner, would assume responsibility for reclamation (with oversight from the State Mine Inspector) and proper treatment of hazardous materials associated with mining operations as required by MSHA, OSHA, RCRA, EPCRA and other regulations for hazardous materials. Implementing the foreseeable uses would entail risks of environmental contamination associated with transporting, handling, and storing hazardous materials.	No direct, indirect, or cumulative impacts expected. Acquisition of the offered lands would not increase federal liabilities for hazardous materials as no known such sites have been identified on the offered lands.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

PHYSICAL RESOURCES						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Climate	No direct, indirect, or cumulative impacts on climate would result from this alternative.	Imperceptible direct impacts to localized wind patterns at a microclimatic scale due to changes in local topography on the project area as a result of mining activities.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts on climate would result from this alternative.	No direct, indirect of cumulative impacts on climate on a local or regional scale. Foreseeable uses would have identical impacts as the Proposed Action; DP sulfide and Lone Star projects would have similar impacts in that localized changes in topography may have microclimatic impacts on wind patterns; these are expected to be imperceptible outside the project area.	No direct, indirect, or cumulative impacts on climate on local or regional scale are expected as a result of public acquisition or management.
Air Quality	No direct, indirect, or cumulative impacts on air quality would result from this alternative. Ambient air quality is retained.	The ambient air quality is expected to decrease but stay within federal and state standards. Model-predicted emissions of criteria pollutants at a localized level during the life of the Project would not exceed standards at the process boundary or at four special receptor sites (the southern tip of the San Carlos Apache Reservation, in the town of Safford, or at the Galiuro or Gila wildernesses). No visual plume impacts expected in Gila and Galiuro wildernesses (Class I airsheds) as a result of the project.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts on air quality would result from this alternative.	No direct, indirect, or cumulative impacts to air quality from the disposal of selected lands; impacts of foreseeable uses at the DP/SJ Project on criteria air pollutants in the region including two Class I airsheds would be identical to Proposed Action alternative. All foreseeable uses would likely result in increased ambient concentrations of criteria pollutants but within standards. DP sulfide project would likely require a Class I air quality permit; Lone Star project would likely require a Class II air quality permit.	No direct, indirect, or cumulative impacts to air quality from criteria air pollutants as a result of public acquisition or management of the offered lands.
Geology	No direct, indirect, or cumulative impacts on geological resources would result from this alternative.	Direct, long-term impact to locatable mineral resources as allowed by the General Mining Law of 1872 and other surface management regulations. Economic mineral potential (metals and common variety minerals) of public lands will be realized under this alternative.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts on geological resources would result from this alternative.	Mineral resources of the selected lands become the property of PD (if negotiations with Melody Claims fail, then 453 acres of selected lands encumbered by 40 third-party mineral claims will be dropped from the exchange); PD currently owns 95% (844) of mining claims that encumber the selected lands. Mineral resources would be developed under the foreseeable uses through implementation of the Dos Pobres/San Juan mine, Dos Pobres Sulfide, and Lone Star projects. No adverse impacts to salable minerals as a result of the exchange.	Acquisition of offered lands would increase public lands available for mineral entry in the Dos Cabezas and Northwest Gila Valley LTMAs; mineral entry would not be allowed on properties acquired in the Gila Box RNCA , Empire-Cienega RCA, and Tuzigoot NM.
Soils	No direct, indirect, or cumulative impacts on soils would result from this alternative.	Direct, long-term impacts to soils; some productivity regained when reclamation is implemented. Indirect impacts on erosion will be reduced by revegetation, and contouring sides and tops to reduce wind and water erosion effects.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts on soils would result from this alternative.	No direct physical impacts to soils as a result of exchange; foreseeable mining uses would result in long-term reduction in soil productivity although not for soils that will be stockpiled and used as growth media at reclamation. Erosion potential of soils would increase as a result of clearing of vegetation, but resultant increased sedimentation effects are not expected off the project area and bedloads recover well before reaching the Gila River.	Public acquires soil resources and BLM manages productivity of soils of the offered lands.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

PHYSICAL RESOURCES						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Groundwater	No direct, indirect, or cumulative impacts on groundwater quality or quantity would result from this alternative.	Model-predicted maximum drawdown of the water table would be 349 feet after about 16 years centered in the San Juan pit, with the drawdown cone not reaching either the Gila River or Bonita Creek; 40-ft drawdown contour reaches San Carlos Indian Reservation boundary. DP Seep would be destroyed. Wellhead pressure at Watson Wash artesian well is predicted to lower by 0.47 ft at 126 years. No direct, indirect, or cumulative impacts expected to existing groundwater quality through compliance with BADCT design standards for potentially discharging mine facilities through APP permit. Risk of discharge to groundwater would be reduced by these measures but cannot be eliminated	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts on groundwater quality or quantity would result from this alternative.	No direct, indirect, or cumulative impacts to groundwater quantity or quality as a result of the exchange. Foreseeable mining uses at DP/SJ Project would result in the same impacts as described for the Proposed Action alternative. Foreseeable mining uses at DP sulfide and Lone Star projects would draw on the same aquifer as the DP/SJ Project, adding to its impacts and extending them over time and area. The magnitude and significance of impacts on other resources (e.g., surface flows of Gila River and other water sources and Indian Trust Assets) would have to be estimated at the time of federal permitting for the projects. not be expected to adversely impact groundwater quality because they would be subject to APP requirements. but there is no information available to determine possible	Public acquisition of the offered lands would not directly, indirectly or cumulatively impact groundwater quality or quantity.
Surface Water	No direct, indirect, or cumulative impacts on surface water quantity or quality, waters of the U.S., or surface flows of the Gila River would result from this alternative.	The total maximum predicted reduction in annual flows in the Gila River as a result of the Project is 129.4 af/yr. Of this volume, 40 af/yr is attributable to tributary channel runoff impacts, 54 af/yr is incidental surface flow impacts, and 35.4 af/yr is from groundwater pumping impacts. According to the groundwater model used to estimate this impact, this maximum reduction would occur at year 416 after Project initiation and extend beyond the 500-year simulation period. The fallowing program proposed to mitigate for surface water impacts is described in Appendix F. No adverse cumulative impacts to surface water are expected upon implementation of this mitigation. Direct and indirect impacts to drainages from sedimentation and scour resulting from stormwater retention and detention in major tributaries such as Cottonwood and Peterson washes are not expected to reach the Gila River. Direct impacts to about 21.4 ac of waters of the U.S. and 93.2 acres of indirect impacts to waters. Direct and indirect impacts to waters of the U.S. mitigated through implementation of COE's Habitat Mitigation and Monitoring Plan, therefore no cumulative impacts to waters of the U.S. A pit lake would be created at Dos Pobres, and existing pit lake enlarged at San Juan. The pH of the water in both pits is expected to be neutral and heavy metal concentrations within federal and state standards.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts on surface water quantity or quality would result from this alternative.	Disposal of selected lands would not directly or indirectly impact surface water quantity or quality. Foreseeable mining uses at DP/SJ Project would directly impact surface water quantity as described under Proposed Action alternative. Mitigation in perpetuity for this reduction in surface flows would preclude indirect and cumulative adverse impacts to surface water quantity in the project area region. Monitoring program will show if model predictions warrant changes in mitigation requirements. Foreseeable mining use at Dos Pobres sulfide and Lone Star would contribute cumulatively to surface water quantity reductions to an unknown degree, however, mitigation requirements would be expected to negate such impacts.	Surface water quantity and quality would not be directly, indirectly, or cumulatively affected by public acquisition of the offered lands.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

BIOLOGICAL RESOURCES						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Vegetation	No direct, indirect, or cumulative impacts to vegetation from this alternative.	A total of about 3,332 acres of land to be impacted, including about 1,935 acres of BLM land (consisting of roughly 529 acres of Sonoran Desertscrub, 1,222 acres of Sonoran Desertscrub-Semidesert Grassland Ecotone, no Semidesert Grassland habitats, and 184 acres of existing disturbed lands); 1,387 acres of PD private lands (274 ac Sonoran Desertscrub, 1000 ac Sonoran Desertscrub-Semidesert Grassland Ecotone, 113 ac disturbed land); and about 10 acres of State land (Sonoran Desertscrub-Semidesert Grassland Ecotone) also impacted. These habitats are common and widespread throughout the southwest and no significant cumulative impacts are expected as a result. Portions of these impact areas would be reseeded with native species.	Impacts would be identical those of the Proposed Action.	No direct, indirect, or cumulative impacts to vegetation from this alternative. Sensitive habitats on the offered lands would not be subject to federal protection.	No physical direct, indirect, or cumulative impacts on vegetation from exchange; vegetation resources, including Walnut Spring, would be under PD management; foreseeable use impacts would be identical to those of Proposed Action, with an additional 5,063 acres of similar types of impacts in the future expected from Dos Pobres sulfide and Lone Star projects. Foreseeable uses would contribute to minor cumulative adverse impacts to these habitats. Revegetation at reclamation is expected to offset some of the impacts to vegetation expected as a result of foreseeable uses.	Public acquisition of riparian habitats at Gila Box RNCA; wetland habitat at Tuzigoot NM; and various xeroriparian habitats in LTMAs in Safford and Tucson Field Offices would exceed acreage of such habitats disposed of with selected lands. Net loss of widespread and common upland habitats within the Safford Field Office. Vegetation resources on offered lands become subject to federal management; those on selected lands come under PD management.
Wildlife	No direct, indirect, or cumulative impacts to wildlife would occur from this alternative.	Direct impacts to game and non-game wildlife inhabiting the project area; estimated direct impacts to up to 35 mule deer and 16 javelina as a result of habitat destruction on both BLM, PD, and State lands. No adverse impacts expected to wildlife from pit lake water quality at the Dos Pobres and San Juan mines. A very small potential for adverse impacts to wildlife (birds, bats) exists from exposure to excess process solution impoundment and PD will include monitoring of these ponds for wildlife use in their APP monitoring program.	Impacts would be identical those of the Proposed Action.	No direct, indirect, or cumulative impacts to wildlife from this alternative. Wildlife habitats on the offered lands would not be subject to federal management.	No direct, indirect, or cumulative impacts to wildlife on selected lands due to exchange as all wildlife remains under AGFD jurisdiction; impacts to wildlife of foreseeable uses on selected lands would be identical to those of Proposed Action, plus additional similar impacts (32 - 55 mule deer lost and 12 - 24 javelina lost) would be expected as a result of potential future implementation of the Dos Pobres sulfide and Lone Star projects.	No direct impacts of exchange on wildlife on offered lands; AGFD retains jurisdiction of wildlife regardless of land ownership. Game species on 3,534 acres of offered properties (except Tavasci Marsh property) would be available for hunting in applicable AGFD Hunt Units. Wildlife habitats on the offered lands would be subject to federal management and protection.
Special Interest Species	No direct, indirect, or cumulative impacts to special interest species from this alternative.	No direct impacts to listed species expected. Four mine features would be directly impacted but none appear to be suitable roost sites for bats. Mitigation measures implemented as described in Appendix F will reduce any potential for indirect impacts to listed species, or critical habitat. No impacts to potentially suitable habitat for *Echinocereus* sp. morphologically similar to Arizona hedgehog cactus (listed as endangered).	Impacts would be identical those of the Proposed Action.	No direct, indirect, or cumulative impacts to special interest species from this alternative. Special status species that may occur on the offered lands would not benefit from federal management.	Habitat for *Echinocereus* cacti morphologically similar to endangered Arizona hedgehog cactus and for Pima Indian mallow goes into private ownership and management. Listed plants on private lands would be protected by ESA if federal nexus is triggered; otherwise Arizona Native Plant Law regulations apply. Federal protection of listed species continues but not with BLM as lead in Section 7 consultation with USFWS. Minor cumulative adverse impacts on potentially suitable habitat for *Echinocereus* sp. morphologically similar to Arizona hedgehog cactus (listed species) as a result of foreseeable uses at Lone Star; nine mine features adversely impacted by foreseeable mining uses but none are considered important bat roosts.	Public would acquire potentially suitable habitats for seven listed species and one candidate species that may occur on the offered properties. BLM acquires habitat in Gila Box known to support *Echinocereus* cactus morphologically similar to endangered Arizona hedgehog cactus; public jurisdiction of Tavasci Marsh which is known to support southwestern willow flycatcher and Yuma clapper rail. BLM or NPS management activities for listed species would apply to the offered lands.
Biodiversity	No direct, indirect, or cumulative impacts on the region's biodiversity as a result of this alternative.	No direct, indirect, or cumulative impacts on the region's biodiversity of the region are expected from this alternative.	Impacts would be identical those of the Proposed Action.	No direct, indirect, or cumulative impacts on the region's biodiversity as a result of this alternative.	No direct, indirect, or cumulative impacts on the region's biodiversity are expected from this alternative.	No direct, indirect, or cumulative impacts on the region's biodiversity are expected from this alternative.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

CULTURAL RESOURCES						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Archaeological Sites	No direct, indirect, or cumulative impacts expected as a result of this alternative.	This alternative would directly (physically) impact 34 of the 117 archaeological sites recorded on the project area (this includes 12 sites located on BLM land, 21 on PD lands, and 1 on state land). Thirty-two of the sites are considered eligible for nomination to the National Register of Historic Places. It is probably that 16 of the impacted sites could be avoided by judicial placement of transmission line components, road alignments, and stockpiled soils.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts are expected as a result of this alternative.	Disposal of the selected lands would impact all 64 archaeological sites on public lands through loss of federal protection. Mitigation for loss of federal protection and impacts of foreseeable mining uses of the selected lands would involve implementing a testing and data recovery plan for all or a representative sample of the impacted sites at the time of exchange approval.	Archaeological resources occurring on the offered lands would come under federal protection and management. This includes historic and prehistoric sites adjacent to the ruins at the Tuzigoot National Monument on the Tavasci Marsh property; sites along Bonita Creek on the Curtis and Amado properties; and sites on the offered properties in the Dos Cabezas LTMA.
Traditional Cultural Properties	No direct, indirect, or cumulative impacts expected as a result of this alternative.	Eleven Indian tribes were consulted about TCPs and sacred sites on the project area. Tribes identified 74 of the 117 archaeological sites as potential TCPs, 41 of which are located on BLM lands. Of the 74 potential TCPs, 23 would be damaged or destroyed by the Proposed Action (9 on public lands, 14 on PD lands). Two potential TCPs (AZ CC:2:200 and 211) have also been identified by Indian tribes as sacred sites. They would be avoided under this alternative and access by tribes would be permitted with reasonable notice. No determination of eligibility as TCPs has yet been made for impacted sites, and consultations with 10 tribes are ongoing.	Impacts of this alternative are expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts are expected as a result of this alternative.	Disposal of selected lands would not physically impact the 41 potential TCPs, including 2 sacred sites, on these lands but would have regulatory implications. Sites on private lands are considered private property; as such, sites would not be subject to consideration under the American Indian Religious Freedom Act or under Exec. Order 13007 regarding sacred sites. Access to TCPs and sacred sites on the selected lands under this alternative would be controlled by PD, which has indicated to BLM that it would allow Indian groups to access the sacred sites with reasonable notice.	Although no tribes identified any potential TCPs on the offered lands, federal protection and access would be provided to any such sites under this alternative.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

SOCIOECONOMIC RESOURCES						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Population and Demographics	No direct, indirect, or cumulative impacts.	Direct, indirect, and cumulative but minor impacts in the Safford area by increasing population by 3.1% (from 1995) with the addition of an estimated 145 households, or 448 individuals. Anticipated growth and the subsequent increased demand upon public services and schools resulting from the Proposed Action are relatively small percentages of the growth projected for Graham County area from 1995 to 2005. New demands on infrastructure should be adequately met through increased tax revenue generated directly and indirectly by the Project. Direct and indirect benefits to local population, including minority and low-income groups by increasing general employment opportunities. Because the largest populations of Native Americans are geographically distant from the Safford area, this group as a whole would be less affected than nearby Hispanic populations in the Safford Valley.	Direct and indirect impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts.	No direct, indirect, or cumulative impacts to population resulting from exchange. Implementing the foreseeable uses at Dos Pobres/San Juan would result in the impacts described under the Proposed Action. Foreseeable uses at Dos Pobres sulfide and Lone Star orebodies would also likely affect population size and demographics in the Safford area, but as no information is yet available about the scale of the mining operations, there is insufficient information available to predict the magnitude or significance of those effects.	No impacts on population size or demographics in or near the offered lands.
Local and Regional Economy	No direct, indirect, or cumulative impacts.	Direct, indirect, and cumulative beneficial impacts stemming from increased employment and tax revenues in the Safford area: construction phase employment would average 470 full-time jobs over 15 mos.; long-term direct and indirect employment would total 644 jobs by the end of the Project; for life of Project, PDSI's cumulative payroll would total $214 million; cumulative local tax revenue would total $57.6 million; PDSI would pay a cumulative total of over $420 million in federal, state, and local taxes (all figures are estimates in 1997 dollars).	Direct and indirect impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts.	No direct, indirect, and cumulative impacts on employment and income expected from the exchange. Graham County would lose $19,634 in PILT payments and gain an undetermined, but likely higher amount in private property tax revenue. Impacts of foreseeable uses at the DP/SJ Project are expected to be identical to those of the Proposed Action. Development of the Dos Pobres sulfide and Lone Star orebodies would affect the local and regional economy, but insufficient information is available to predict the magnitude or significance of those effects.	No impacts on local or regional employment or income in or near the offered lands. Pima, Graham, Santa Cruz, Cochise and Yavapai counties with offered properties would lose tax revenue and gain PILT payments. Net change in tax revenues for the counties after PILT are not expected to be significant: Graham: +$972; Pima: -$1,661; Santa Cruz: -$823; Cochise: +$181; Yavapai: -$4,264.
Infrastructure	No direct, indirect, or cumulative impacts.	Direct, indirect, and cumulative but minor impacts to housing, schools, utilities, and emergency response services in the Safford area. The Project would generate an increase of 3.1% in the population; increases in local tax revenues resulting from the Project would be disproportionately higher than this population growth resulting from the Project. This increase in revenues is expected to offset any potentially adverse impacts to existing infrastructure generated by the relatively small increase in population attributable to the Project.	Direct and indirect impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts.	No effects on local infrastructure from disposal of the selected lands. Foreseeable uses at DP/SJ Project would have identical effects on local infrastructure as Proposed Action. Development of the Dos Pobres sulfide and Lone Star orebodies would also likely affect the local infrastructure in a similar manner, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the magnitude or significance of those effects.	No impacts on infrastructure in or near the offered lands.
Transportation	No direct, indirect, or cumulative impacts.	No direct impacts. Indirect and cumulative impacts would be limited to a small overall increase in traffic in the Safford area, most noticeable on the Safford-Bryce and Airport roads, but not expected to reduce the Level of Service (LOS) ratings of the roads. All roads and intersections would continue to operate at acceptable levels of service. Increases in local tax revenues resulting from the Project are expected to offset any adverse impact to pavement caused by truck traffic.	Direct and indirect impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts.	No impacts expected from exchange on traffic and transportation. Indirect and cumulative impacts of the foreseeable uses at DP/SJ Project would be identical to those of the Proposed Action. Development of the Dos Pobres sulfide and Lone Star orebodies would affect transportation in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the magnitude or significance of those effects.	No impacts on transportation in or near the offered lands.

Table 2-14. Comparative Summary Table of Impacts of Alternatives for the Dos Pobres/San Juan Project

INDIAN TRUST RESOURCES						
Resource/Issue	Mine Plan Alternatives Set			Land Exchange Alternatives Set		
	No Action	*Proposed Action*	*Partial Backfill of San Juan*	*No Land Exchange*	*Land Exchange Alternative*	
					Selected Lands	*Offered Lands*
Indian Trust Assets (Indian water rights)	No direct, indirect, or cumulative impacts to Indian trust assets.	Direct impacts to Indian water rights held by the San Carlos Apache Tribe and the Gila River Indian Community are avoided by mitigating in perpetuity for predicted long-term reduction in appropriable surface flows in the Gila River due to groundwater pumping and stormwater diversions. No indirect or cumulative impacts to Indian trust assets.	Impacts expected to be identical to those of the Proposed Action.	No direct, indirect, or cumulative impacts to Indian trust assets.	No impacts to Indian trust assets as a result of the exchange; foreseeable use impacts from Dos Pobres/San Juan Project and mitigation are identical to those of the Proposed Action. Foreseeable uses at Dos Pobres sulfide and Lone Star projects would also be expected to result in continued or increased reductions of Gila River flows if groundwater continues to be the water supply source. Mitigation would be increased accordingly, therefore no net impacts to surface flows, therefore, no impacts to Indian trust assets would be expected. No cumulative impacts would result from this alternative.	No Indian trust resources are known to be associated with offered lands. No direct, indirect, or cumulative impacts expected to trust resources through public acquisition of the offered lands.

Volume 1

Chapter 3: The Affected Environment

CHAPTER 3

THE AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the existing natural and human environment that would potentially be affected by the Proposed Action and its alternatives. For purposes of analysis, the discussion focuses on two geographic areas: the project area and the offered lands. The term "project area" used throughout this document refers to an approximately 36,760-acre area (depicted in Figure 1-2) that encompasses lands involved in both the MPO and the exchange. The project area includes BLM, PD, and State lands on which the proposed mine plan would occur; additional BLM public lands selected by PD for the proposed land exchange; PD-owned private lands; and a non-PD-owned private inholding. The second geographic focus of this analysis, the offered lands, are PD-owned properties scattered among several locations throughout southern and central Arizona that are being offered by PD in exchange for the selected public lands in the project area.

The description of the project area begins with a regional overview, then proceeds with a more detailed treatment organized into six major resource categories: Land Use, Physical Resources, Biological Resources, Cultural Resources, Socioeconomic Resources, and Indian Trust Resources. For some resources, baseline data were collected within study areas. The location and extent of these study areas vary depending on the type of data being collected. The offered lands included in the land exchange alternative are described at the end of the chapter. They are grouped into either the base package of offered lands or the optional package of offered lands (see the Land Exchange Alternative Set in Chapter 2 for an explanation of these packages). Within these two divisions, each offered property is described according to the first five major resource categories listed above. Descriptions of the existing conditions of resources on the three optional properties that were not included in the land exchange alternative (Davison, Lehner Ranch, and Lincoln Ranch properties) are provided in Appendix E.

3.2 PROJECT AREA

The approximately 36,760-acre project area[1] lies within the Safford Valley on the south-facing slope of the Gila Mountains, about seven to eight miles[2] north of the Gila River near the City of Safford, in Graham County, Arizona (see Figure 1-1 in Chapter 1). Safford is the county seat and serves as a regional service center for much of southeastern Arizona and parts of southwestern New Mexico. Its economy is mainly supported by retail, government, and agriculture (ESI 1997). Graham County's median household income ranks among the lowest in the State. The county is sparsely populated, with a large percentage of Native American and Hispanic residents. Most of the Native Americans live on the San Carlos Apache Reservation, which covers approximately the northern third of the county and lies in close proximity to the project area (see Figure 1-1).

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[1] All acreage provided in this document are approximate based on data retrieved through Computer-Aided Drafting (CAD) software. Table totals may not add up due to rounding error.

[2] As measured from the center of the Dos Pobres and San Juan pits to the north bank of the Gila River at the Safford (Eighth Avenue) Bridge.

The climate in the region is semi-arid, hot in the summer and moderate in the winter. Mean annual precipitation in Safford is 9.8 inches per year (Dames & Moore 1996a), with about half of the precipitation falling during summer thunderstorms and the remainder occurring as intermittent winter or spring storms (Sellers and Hill 1974). Prevailing daytime winds are generally from the northwest, blowing up the Safford Valley (Class One Technical Services 1997).

Figure 3-1 shows the topography and some of the major drainages of the project area. Elevations range from about 3,040 to 5,400 feet above mean sea level. Dominant landforms range from nearly level and gently sloping alluvial and colluvial terraces in the southern part of the project area to steep, rocky slopes in the northern part. The ground surface is generally rough, broken, covered by gravel and cobbles, and sparsely vegetated. Over much of the project area, the dominant plant association is the creosote-bursage association of the Sonoran Desertscrub biotic community (SWCA 1997a). Several large, ephemeral washes, including Peterson, Cottonwood, Talley, and Watson Washes, drain the area from roughly the northeast to the southwest, eventually flowing into the Gila River (Figure 3-1).

The project area is part of the Safford Mining District, an area containing several known copper ore deposits, including the Dos Pobres, San Juan, Lone Star, and Sanchez deposits (see Figure 1-1). These deposits generally are located along a northwest-southeast alignment governed by regional structural geology. Portions of the Mining District have been mined intermittently since the late 1800s, mostly by small operators. Phelps Dodge Corporation entered the Safford Mining District in 1957 when it acquired existing mining claims north of Safford and discovered the Dos Pobres copper deposit the following year (PDSI 1996). Exploration progressed at Dos Pobres, and construction began in 1968 on underground workings to mine the deep sulfide orebody. Operations ceased in 1982 when declining copper prices resulted in unfavorable economics for the underground operation (ibid.). Interest in the Dos Pobres property was renewed in 1991 when additional exploration identified a leachable, primarily oxide, copper resource above the deeper sulfide portions of the deposit.

The San Juan deposit, located less than two miles to the southeast of Dos Pobres, was known long before PD's arrival in the Mining District. It was mined for a short period at the turn of the century following the discovery of chalcocite copper veins. Mining resumed there in the late 1960s-early 1970s, with ore from the small open pit being processed to produce copper precipitate (ibid.). Phelps Dodge acquired the San Juan mine property in 1994 from a consortium of private owners.

The Lone Star orebody, located southeast of the San Juan property, was discovered in 1955 by Kennecott Copper Corporation (ibid.). Kennecott conducted exploratory and assessment work at Lone Star from 1958 until the mid-1980s, including construction of an 800-foot shaft and underground workings to obtain bulk ore samples. Phelps Dodge purchased the Lone Star property from Kennecott in 1987.

The Sanchez copper deposit at the southeastern end of the Mining District has been evaluated for possible development by several mining companies over the years, most recently by AZCO Mining Inc. In 1993, AZCO received several environmental permits to develop the leachable copper deposit, including BLM approval of the Sanchez Copper Project's Plan of Operations (see BLM 1992). Phelps Dodge purchased rights to the approved Sanchez Copper Project in 1995.

3.2.1 Land Use

3.2.1.1 Public Lands Management

As a public lands management agency, BLM is responsible for the balanced management of public lands and resources and their various values so that they are maintained in a combination that best serves the needs of the American people. Such values include, but are not limited to, recreational, range, timber, mineral, watershed, fish and wildlife, wilderness and natural, scenic, scientific, and cultural values.

Since 1981, BLM has been responsible under regulations at 43 CFR §3809 for administering MPOs and Mining Notices filed for BLM-administered public lands. The Safford Field Office of the BLM currently administers six MPOs and 22 Mining Notices that have been submitted and authorized. BLM administration of mining plans and notices entails reviewing the plan or notice for completeness; preparing appropriate NEPA documents; authorizing reclamation plans and ensuring that the operator has secured the required reclamation bonds; advising the operator of any permits required by other agencies; conducting periodic inspections during operations for compliance with permit conditions; and inspecting reclamation efforts for consistency with the reclamation plan after closure. The reclaimed federal lands then return to the public domain and are managed for the post-mining land uses proposed in the reclamation plan.

In addition to following the general management prescriptions of the Safford District RMP, as amended (BLM 1991, 1994), BLM's other primary responsibilities in the project area include administering grazing allotments; maintaining existing public and physical access to public lands for recreation and other public uses; and negotiating rights-of-way, easements, and other realty actions allowed by the RMP (BLM 1991).

3.2.1.1.1 Land Ownership. The land ownership pattern in the project area and surrounding environs is depicted in Figure 1-2 in Chapter 1. Table 3-1 summarizes the acres of land administered by the BLM and belonging to PD, the State of Arizona, and non-PD private entities that would be affected by mining activities as proposed in the MPO, and the acres of similarly owned land in the project area. PD has submitted an offer to purchase the 320-acre parcel of state land on the north of the project area side (south half of Section 21, see Figure 1-2). As of this writing, this land sale is imminent (J. Korolsky, PDSI, pers. comm.). Lands in the project area that will be avoided by the proposed Project consist of the patented (i.e., privately owned) Horseshoe Claims, which are owned by several private parties other than PD and located in portions of Sections 8 and 17, and the Melody Claims, which are federal lands encumbered by third-party mining claims located in portions of Sections 11 and 14 (see Figure 1-2).

Table 3-1. Land Ownership Acreage Summary for the MPO and the Project Area

	BLM-administered	Phelps Dodge	State of Arizona	Non-PD Private	TOTAL
MPO	1,935	1,387	10	0	3,332
Project Area	17,000	19,320	320	110	36,760

Land ownership patterns and encumbrances such as rights-of-way and easements affect the management of public lands, as do parcel configuration factors, such as the number, size, and shape of parcels in a given area. The number of parcel "corners" shared with other landowners can be used as a rough index of management difficulty. In general, the more corners shared with other landowners, the more complex the management responsibilities. In the project area depicted in Figure 1-2, the BLM manages three federal land parcels bordered by approximately 78 miles of boundary lines. Currently, the BLM shares 116 corners with

PD, two corners with the State, and seven corners with non-PD private land owners (i.e., Horseshoe property) within the project area.

3.2.1.1.2 Special Management Areas. Special Management Areas are congressionally or administratively designated geographic areas within a BLM field office requiring explicit management to achieve BLM's special objectives. In the Safford Field Office, such areas include Wildernesses; Areas of Critical Environmental Concern (ACECs); and National Conservation Areas (NCAs, including the subgroup designated Riparian National Conservation Areas [RNCAs]). The Safford Field Office is responsible for managing public lands within six wildernesses and one wilderness study area totaling 78,560 acres, eleven ACECs totaling about 28,788 acres, and one RNCA totaling 21,767 acres (as listed in Table 3-2). In addition to these 19 special management areas, four river segments totaling 51.1 miles within the Safford Field Office have been recommended by the BLM and the Department of the Interior for designation as Wild and Scenic Rivers (W&SRs) (see Table 3-2). Although a legislative EIS for all river segments in Arizona considered eligible for W&SR status was completed in 1994, congressional approval of those segments recommended for designation by the BLM is still pending. In the meantime, the recommended segments within the Safford Field Office, including a 0.25-mi-wide corridor on either side of the stream, are being managed by the BLM to protect the identified wild and scenic values. Therefore, the Safford Field Office is responsible for managing a total of 23 special management areas.

Table 3-2. Special Management Areas in the Safford Field Office

Wilderness	Areas of Critical Environmental Concern	Recomm. Wild & Scenic Rivers	RNCA
North Santa Teresa Wilderness	111 Ranch Research Natural Area ACEC	Gila River (Gila Box)	Gila Box*
Fishhooks Wilderness	Turkey Creek Riparian ACEC	Lower San Francisco River	
Peloncillo Mountains Wilderness*	Table Mountain Research Natural Area ACEC	Aravaipa Creek	
Dos Cabezas Mountains Wilderness*	Desert Grasslands Research Natural Area ACEC	Bonita Creek	
Redfield Canyon Wilderness*			
Aravaipa Canyon Wilderness*	Hot Springs Watershed ACEC*		
Baker Canyon Wilderness Study Area	Bear Springs Badlands ACEC		
	Willcox Playa Nat'l Natural Landmark ACEC		
	Dos Cabezas Peaks ACEC		
	Eagle Creek Bat Cave ACEC		
	Bowie Mountain Scenic ACEC		
	Guadalupe Canyon Outstanding Natural Area ACEC		

* Management plans, either in interim, draft, or final form, have been prepared for or apply to these areas.
Source: BLM 1991, 1994; S. Knox, BLM.

For some, but not all, of the Special Management Areas listed above, the BLM has prepared a detailed plan that provides specific management guidance for the resources within that area. These plans may be in the form of an Activity Plan or a Management Plan. Special Management Areas for which some type of plan has been prepared are indicated with an "*" in Table 3-2. BLM manages the Special Management Areas that do not have such plans according to the general management prescriptions approved in the Safford District RMP, as amended.

3.2.1.2 Access and Recreation

3.2.1.2.1 Access. Four primary roads lead to and through the project area: Solomon Pass Road, Lone Star Mountain Road, San Juan Mine Road, and Phelps Dodge Mine Road (a.k.a. PD Mine Road or Dos Pobres Road) (see Figure 1-1). These roads provide varying degrees of physical access from Airport and Safford-Bryce roads northward toward the Gila Mountains. Lone Star Mountain and Phelps Dodge Mine roads are barred by gates as they enter PD's private lands and provide only limited public access to federal lands and no access to public recreational areas.

Users of Solomon Pass Road and San Juan Mine Road include, but are not limited to, the public for recreation and to reach public recreational areas, ranchers to manage livestock, PD and other mining claimants to reach their property and mining claims, a utility company in operation of a powerline, the BLM in the administration of the public lands, and state agencies. These two roads are linked at their northern ends by West Ranch Road, which runs east-west along the northeastern boundary of the project area (see Figure 1-1). All but the lower three miles of Solomon Pass Road and all of San Juan Mine and West Ranch roads are unpaved and suitable for two- or four-wheel-drive, high-clearance vehicles. Although these are considered ranch roads rather than official county roads, Graham County occasionally maintains them as a courtesy. The lower three miles of Solomon Pass Road are chip-sealed and maintained by Graham County as an official county road.

Solomon Pass Road originates off of Airport Road near the Safford Airport. This road provides public and physical access to the eastern portion of the project area, to Bonita Creek and the Gila Box Riparian National Conservation Area (RNCA) via Lee Trail, and to the north-facing slopes of the Gila Mountains. San Juan Mine Road provides public and physical access to the Melody Claims; physical access onto the PD's privately held San Juan Mine property; and physical and public access to the Johnny Creek area of the Gila Mountains. PD currently allows access across their property on the San Juan Mine Road to reach areas of public land to the north. Access to the pit area, however, is limited to authorized personnel only. Owners of the patented Horseshoe Claims access their property via a dirt spur road off of Solomon Pass Road. Both Solomon Pass and San Juan Mine Roads join West Ranch Road, which forms the southern segment of the Johnny Creek Loop, a popular recreational drive that leads to public lands in Johnny Creek, a tributary of upper Bonita Creek. West Ranch Road also provides access to the Safford-Morenci trailhead, the starting point of a well-known historical and recreational trail.

3.2.1.2.2 Recreation. Recreational opportunities on the federal lands in the project area are dispersed; no developed recreational sites are present. Recreational use includes backcountry driving, hiking, horseback riding, mountain biking, and hunting. In addition, approximately 1000 people use Solomon Pass Road each year, approximately half to view wildlife in the Gila Box RNCA and remainder who access Bonita Creek in the for hiking and backpacking.

The BLM estimates that approximately 2,800 to 3,100 backcountry drivers use the ranch roads in and near the project area each year (S. Knox, Outdoor Recreation Planner, BLM Safford Field Office, pers. comm. 1998). Other recreational users of these roads include about 75 horseback riders and roughly 30 mountain bike riders a year. Most people use the Solomon Pass, San Juan Mine, West Ranch, and Johnny Creek Loop Roads, but a few use Dos Pobres Mine Road and the unnamed smaller roads in the northwest portion of the project area.

The most important hiking trail in the region is the Safford-Morenci Trail. Approximately 15 miles long, the trail was used in the late 1800s-early 1900s as one of the routes between Safford and the mines around present-day Morenci. Haulers used the trail to carry meat and produce to the mining communities and fuelwood to the smelters. Because of its importance to historical events in the region, the Safford-Morenci Trail has been determined eligible for listing in the *National Register of Historic Places*. The west trailhead

is located along West Ranch Road. From there, the trail's route crosses the Gila Mountains north of Lone Star Mountain and descends through Johnny Creek into Bonita Creek Canyon. From Bonita Creek, it climbs to the top of Turtle Mountain at Bellmeyer Saddle on the San Carlos Apache Reservation.[3] The trail then descends into South Smith Canyon, terminating at its east trailhead near the Eagle Creek pumping station. The Safford-Morenci Trail has not been maintained by BLM for many years and requires the use of a topographic map and compass to follow, but, based on old visitor registers, it is estimated that 50 to 75 people per year hike the physically challenging and poorly marked Trail for recreation (S. Knox, Outdoor Recreation Planner, BLM Safford Field Office, pers. comm. 1998).

Through commercial special recreational permits, the BLM allows guides and outfitters to provide recreational services, including trail rides, hikes, pack trips, hunting trips, and vehicle tours on the BLM-administered lands. The BLM Safford Field Office currently authorizes four such permits for activities in the project area. Since 1994, BLM has also granted a competitive special recreation permit for an annual 50-mile-long endurance horseback race called the Safford Johnny Creek Equestrian Endurance Ride. This event crosses a portion of the project area. The permit is coordinated with other public land resources and uses and is subject to renewal on an annual basis. Participants include 85-90 riders and 30-40 spectators (S. Knox, Outdoor Recreation Planner, BLM Safford Field Office, pers. comm. 1998).

The project area is located within Arizona Game and Fish Department Management Unit 28 (often called "Hunt Unit 28"). Deer, javelina, quail, and dove are commonly hunted game species in the project area vicinity. Hunting most commonly occurs 1) on public lands along the northern edge of the project area; 2) west of Salt Trap Tank; and 3) adjacent to Solomon Pass, San Juan Mine Road, and PD Mine Road. No hunting is allowed on PD-owned private lands within the project area. The BLM estimates that approximately 240 hunters use the federal and state lands in the project area annually. Of this number, approximately 55 hunt deer, 45 hunt javelina, 110 hunt quail, and 30 hunt dove (S. Knox, Outdoor Recreation Planner, BLM Safford Field Office, pers. comm. 1998).

3.2.1.3 Encumbrances

Encumbrances on public lands include rights-of-way (ROWs) and easements. There are seven ROWs appurtenant to the project area. Six of the ROWs were granted for transmission lines for either telephone and telegraph or electric power service to PD or previous mine operators. Table 3-3 below identifies the ROW grantees and the locations of the ROWs/authorizations. Locations of the ROWs are depicted on Figure 3-2.

3.2.1.4 Agriculture and Grazing

The U.S. Natural Resources Conservation Service (NRC, formerly the Soil Conservation Service [SCS]) is responsible for identifying prime or unique farmlands. No prime farmlands have been designated in the project area (SCS November 1983 Map entitled " Important Farmlands, Graham County, Arizona"), although such lands have been designated south of the project area within the floodplain of the Gila River and along Highway 191 south of Safford.

[3] Trail users must contact the San Carlos Apache Tribe and the Arizona State Land Department to acquire the necessary permits to use the portions of the trail that traverse the San Carlos Apache Reservation and state lands, respectively.

Table 3-3. Rights-of-Way Authorized on the Project Area

Right-of-Way Type/BLM ROW #	Grantee	General Location
Electric Power Distribution Line AZA 1091	Graham County Electric	SE¼SW¼, sec. 2; E½E½SE¼, sec. 10; W½, sec. 11; NW¼NW¼, sec. 14; E½E½, sec. 15, T6S, R26E
Telephone and Telegraph Line AZA 2773	US West Communications	Lots 2, 3, and 4, N½SE¼, sec. 34, T5S, R26E; and lots 6, 8, 9, E½SW¼, sec. 2, T6S, R26E
Electric Power Transmission Line AZA 5340	Graham County Electric	S½SE¼SW¼, sec. 2; N½NW¼NE¼, N½NE¼NW¼, sec. 11, T6S, R26E
230 kV Electric Power Transmission Line AZA 9015	Arizona Electric Power Cooperative	Lot 4, W½SW¼, sec. 4; NE¼, N½NW¼, sec. 9; S½NW¼, N½SW¼, SE¼, sec. 10; S½SW¼, sec. 11; NE¼, N½NW¼, sec. 14, T6S, R26E; S½NW¼, sec. 20, T6S, R27E
Radio Station Site and Access Road AZAR 029939	US West Communications	SE¼SW¼, SW¼SE¼, sec. 2, T6S, R26E
Telephone and Telegraph Line AZA 11857	US West Communications	N½NE¼, S½SE¼NW¼, NE¼NW¼SW¼, N½SE¼NW¼SW¼, S½SE¼NW¼SW¼ sec. 35, T6S, R27E
7.5 kV Electric Power Line AZA 20635	Phelps Dodge Corporation	S½SW¼, sec. 2; NW¼SW¼, N½SE¼SE¼, SW¼NE¼SE¼, S½NW¼SE¼, sec. 3; S½NE¼, SE¼NW¼, NW¼NW¼, NE¼NE¼SE¼, sec. 4; and lot 1, sec. 5, T6S, R26E

The BLM Safford Field Office administers 260 grazing allotments. All the public lands proposed for mining use and exchange are currently included within six of these allotments: the Bryce, Talley Wash, Rest Haven, Johnny Creek allotment, Lone Star allotment, and Bonita Creek allotment (Figure 3-3). Table 3-4 gives the total acreage of BLM-administered lands, selected lands, and PD-owned lands within these six allotments, the corresponding stocking capacity in Animal Unit Months (AUMs) supported by these lands, and BLM-registered range improvements on the selected lands for each allotment (SWCA 1997b). The locations of these range improvements are depicted in Figure 3-3.

BLM receives income from annual grazing fees paid by range allottees. At the 1997 federal grazing fee of $1.35 per AUM, Safford Field Office's 1997 income from grazing revenues on the selected lands portions of the allotments is approximately $882, which represents about eight percent of the Field Office's total annual grazing receipts ($10,436) from these allotments (Table 3-5).

3.2.1.5 Mineral Rights

Real property carries with it certain rights that can be owned. Two of these rights are commonly referred to as the surface estate and the mineral estate. For any given property, a single entity can own both estates, creating what is commonly referred to as "whole estate," or different entities can own either estate independently of the other, creating what is commonly referred to as "split estate." Within the project area, 1,320 acres are split estate. In Section 16 of Township 6 South, Range 26 East, and in Section 32 of Township 5 South, Range 27 East, the United States owns, and BLM administers, the surface estate, while Arizona owns the mineral estate. In Section 21 of Township 5 South, Range 26 East, the BLM administers the mineral estate to the SW¼ of the NW¼ of that section, while the State of Arizona owns the surface estate. All remaining property rights in Section 21 are owned by the State.

Table 3-4. Summary of Acreage and Stocking Capacity for BLM Lands, Selected Lands, and PD-Owned Lands within Six Range Allotments (Percents given as percent of total allotment. Range Improvements listed for selected lands only.)

ALLOTMENT (Operator)	ALLOTMENT ACREAGE				STOCKING CAPACITY (Animal Unit Months, or AUMs)			RANGE IMPROVEMENTS
	Total Allotment	BLM land	Selected Lands	PD lands	Total BLM AUMs	Selected Lands AUMs	PD AUMs	
Bryce Allotment (Gary Bryce)	54,000	20,470 (38%)	1,723 (3%)	6,099 (11%)	1,407	45	155	1. Bryce/Talley Wash boundary fence (#48)
Talley Wash Allotment (Page Land & Cattle Co.)	9,703	6,901 (71%)	4,338 (45%)	2,775 (28%)	127	57	36	1. Stewart/Golding fence (#274) 2. Dirt tank (#665) 3. Dirt tank (#666) 4. Dirt tank (#667)
Rest Haven Allotment (Bud Smith & Bob Bell)	2,317	1,868 (81%)	232 (10%)	0 (0%)	Designated ephemeral--no stocking capacity indicated			1. 4612/4613 boundary fence77
Lone Star Allotment (Phelps Dodge Corp.)	31,829	18,264 (57%)	6,348 (20%)	8,582 (27%)	1,052	210	284	1. GA reservoir (#1417) 2. John corral (#1340) 3. Storage house well (#1347) 4. Peterson wash pipeline (#3555)
Johnny Creek Allotment (Kennedy Curtis)	23,291	20,069 (86%)	4,229 18%)	3,233 (14%)	1,804	325	308	1. Rattlesnake fence (#923) 2. Rattlesnake tank (#926) 3. Mark tank (#1374) 4. Below Boo tank (#845) 5. Osito reservoir (#4088) 6. Interior Pasture Fence (#794) 7. Golding/West fence (#284) 8. Burro pipeline (#4428)
Bonita Creek Allotment (Carlos Amado)	25,171	24,361 (97%)	124 (<1%)	180 (<1%)	3,341	16	23	1. Dry Canyon tank (#1237) 2. Sam corral (#1243) 3. Boundary fence (#134)
TOTAL	**146,311**	**91,933 (63%)**	**16,994 (12%)**	**20,869 (12%)**	**7,731**	**653**	**756**	**24 Improvements**

Table 3-5. BLM Income for 1997 from Six Grazing Allotments and Selected Lands Portions of the Allotments

Allotment	Total 1997 BLM Grazing Fee	Fees from Selected Lands Portion Only	Percent of Total Income from Selected Lands
Bryce Allotment	$1,900	$61	3%
Talley Wash Allotment	$171	$77	45%
Rest Haven Allotment	$0	$0	N/A*
Lone Star Allotment	$1,420	$284	20%
Johnny Creek Allotment	$2,435	$439	18%
Bonita Creek Allotment	$4,510	$22	<1%
Total Income	**$10,436**	**$882**	**8%**

*N/A = not applicable to ephemeral allotments

In Sections 16 and 32 discussed above, the split estate resulted from a land exchange between the BLM and the State of Arizona completed in 1941 and 1942, in which Arizona retained ownership to the mineral estate. In Section 21, a similar land exchange completed in 1945 resulted in the BLM retaining administrative responsibility for 40 acres of mineral estate.

3.2.1.5.1 Federal Minerals. On the BLM-administered lands within the project area, approximately 884 mining claims have been filed (Wahl 1997a). Of these, PD owns 844 claims (95 percent), and R.L Whitmore and others own the remaining 40 (five percent), known as the Melody Claims Group(ibid.). The location of the Melody Claims is shown on Figures 1-2 and 3-2.

The BLM has not entered into any mineral leases, such as for oil, coal, or gas, or salable mineral contracts, such as for sand and gravel, for the project area. In the Agreement to Initiate (ATI), BLM segregated the selected lands from further appropriation under mineral laws for a period of five years from the date of notation. This precludes additional mining claims from being made on the selected lands while the environmental review process for the Project is underway.

3.2.1.5.2 State of Arizona Minerals. The State of Arizona has retained the mineral rights to Sections 16 and 32 within the project area; BLM administers the surface rights. Completion of a land exchange that includes these areas would be subject to the State's rights to these minerals. PD holds a mineral exploration permit from the State for the northern half of the State-owned mineral estate and a mineral lease for the southern half in Section 32, T5S, R27E. There are no permits or leases on the state-owned minerals in Section 16, T6S, R26E.

3.2.1.6 Surface Water Rights

Surface water rights totaling 238.06 acre-feet per year (af/yr) are associated with the selected lands and are listed in Table 3-6. An entity with legal rights to use the land (e.g., landowner or leasee) can file for surface water rights. On the selected lands, BLM holds 16 water rights for 137.54 af/yr; an individual, K.W. Curtis, holds five water rights for 8.87 af/yr; an individual, G.A. Golding, holds one water right for 1.12 af/yr; and Page Land and Cattle Co. (PL&C) holds 11 water rights for a total of 77.93 af/yr. All these surface water rights have been designated for stock watering or wildlife purposes. The selected lands are not in an Active

Table 3-6. Surface Water Rights on the Selected Lands

Surface Water Right Number	Holder Name	Water Source	Annual Volume (af)	Specified Use[1]	Location			
					S	T	R	¼ Sec
36-0072391	Page Land & Cattle (PL&C)	Bowman Tank Draw	0.20	S	33	5S	26E	SE, SW
36-0072392	PL&C	Mineral Claim	0.20	S	3	6S	26E	SE, NW
36-0072393	PL&C	Cueto Tank	0.20	S	8	6S	26E	SW, NE
36-0072394	PL&C	Blocky Tank	0.20	S	9	6S	26E	NE, NW
36-0072395	PL&C	Stewart Tank	0.10	S	9	6S	26E	SW, NW
36-0081002	K.W. Curtis	Walnut Spring	0.61	S	26	5S	26E	SE, SE
38-0019125	BLM	Unknown	20.00	S, W	10	6S	27E	NE, NW
38-0019177	BLM	Unnamed	20.00	S, W	9	6S	27E	NE, NE
38-0019179	BLM	Unnamed	20.00	S, W	33	5S	27E	SW, NW
38-0019207	BLM	Unnamed	10.00	S, W	2	6S	26E	SW, NE
38-0019208	BLM	Talley Wash	10.00	S, W	4	6S	26E	SE, SW
38-0019209	BLM	Cottonwood Wash	10.00	S, W	3	6S	26E	NE, NE
38-0019273	BLM	Unnamed	10.00	S, W	8	6S	26E	SW, NE
38-0019274	BLM	Cottonwood Wash	10.00	S, W	3	6S	26E	SW, NW
38-0019287	BLM	Unnamed	1.30	S, W	35	5S	26E	SE, SE
38-0019390	BLM	Bear Spring	1.30	S, W	36	5S	26E	NW, NE
38-0019393	BLM	Bear Spring	3.80	S, W	31	5S	27E	SE, NW
38-0024438	BLM	Bear Spring	20.00	S, W	32	5S	27E	NE, SW
38-0024930	Phelps Dodge	Runoff	1.50	S	17	6S	27E	NW, SW
38-0024931	Phelps Dodge	Runoff	0.80	S	33	5S	27E	SW, NW
38-0024934	Phelps Dodge	Runoff	0.30	S	3	6S	27E	SW, SW
38-0024941	Phelps Dodge	Runoff	10.00	S	2	6S	26E	SW, NE
38-0027727	K. W. Curtis	Ben Hur Canyon	1.21	S, W	31	5S	27E	NE, NW
38-0027731	K. W. Curtis	Ben Hur Canyon	1.03	S, W	36	5S	26E	NW, NE
38-0027734	K. W. Curtis	Spring Canyon	4.22	S, W	33	5S	27E	NE, NW
38-0027738	K. W. Curtis	Various Canyons Above	1.80	S, W	32	5S	27E	NE, SE
38-0072385	PL&C	Bowman Tank Draw	0.20	S	33	5S	26E	SE, SW
38-0072386	PL&C	Stewart Tank	0.60	S	9	6S	26E	SW, NW
38-0072387	PL&C	Blocky tank	1.20	S	9	6S	26E	NE, NW
38-0072388	PL&C	Cueto Tank	1.75	S	8	6S	26E	SW, NE
38-0072389	PL&C	Mineral Claim	0.90	S	3	6S	26E	SE,NW
38-0089920	BLM	Unnamed	0.29	S, W	17	6S	26E	NE, NW
38-0089921	BLM	Unnamed	0.41	S, W	3	6S	27E	NW, NW
4A-0001418	PL&C	Fork of Hackberry Wash	72.38	S	27	5S	26E	NW, SW
4A-0001675	G.A. Golding	Cottonwood Wash	1.12	S	26	5S	26E	SE, SE
		TOTAL	237.62					

[1] S= Stock watering, W = Wildlife
Source: ADWR 1995 and 1996.

Management Area (AMA) or Irrigation Non-Expansion Area (INA) under the State of Arizona 1980 Groundwater Management Act. On PD's private lands in the project area, four separate entities hold water rights totaling 5.27 af/yr (Table 3-7). All these water rights have been designated for stock watering or wildlife purposes.

Table 3-7. Surface Water Rights on PD's Private Lands in the Project Area

Surface Water Right Number	Holder Name	Water Source	Annual Volume (af)	Specified Use[1]	Location			
					S	T	R	¼ Sec
36-0060073.1	G.A. Bryce	Little Spring No One	1.61	S	32	5S	26E	NW, NE
36-0072390	Page Land & Cattle	Hackberry Spring	0.30	S, W	27	5S	26E	NW, NW
4A-0002477	A.T. West	Cottonwood Spring	1.68	S	27	5S	26E	SE, SE
4A-0002478	G.A. Golding	Cottonwood Tunnel Spring	1.68	S	34	5S	26E	NE, NE
		TOTAL	**5.27**					

[1]S= Stock watering, W = Wildlife
Source: ADWR 1995 and 1996.

3.2.1.7 Blasting Noise and Vibrations

Phelps Dodge currently does not discharge explosives in the project area. As part of their possible future exploratory activities at Lone Star, PD may need to blast for road construction (S. Eady, PDSI, pers. comm.). These blasts would differ from the proposed blasting for the Project in two ways: 1) blasting would occur only over a short period of time, probably two to three months; and 2) blast charges would be much reduced (each discharge would involve about ten, 3-inch-wide, 15-foot-deep holes, with about 10 pounds of ANFO explosive vs. mine blasts using 6,000 pounds of ANFO).

3.2.1.8 Visual Resources

The project area lies on a gradually sloping, hummocky alluvial fan terrace and low foothills along the south-facing flank of the Gila Mountains. Numerous large and small drainages score the often-cobbly/gravelly landscape surface. The general landscape in the project area is predominately natural desert upland in character, with about 521 acres disturbed by former mine operations. The following characterization of the existing land/water, vegetation, and structures on the project area is based on the view from Highway 70 near 20th Avenue (Knox 1997). Foreground and middleground views (referred to here collectively as fore-middleground views) are defined as zero to two miles in distance from the viewpoint; background views range from two miles to the horizon at the crest of the Gila Mountains roughly 10 miles away. The project area lies within the background of a commonly viewed scene visible from the City of Safford; neighboring towns; and US 70 and US 191, the main transportation corridors in the vicinity of the project area.

3.2.1.8.1 Land/Water. As seen from the town center of Safford looking toward the Gila Mountains, the background view includes a natural terrace above the Gila River, sloping gently uphill to the toe of the Gila Mountains and its foothills. The Gila Mountains are steeply sloping, with angular and diagonal ridges rising to the crest of the mountains. The horizon is formed by the crest, which undulates against the skyline. The fore-middleground view is composed of flat agricultural fields that stretch from the observation point northward to the Gila River and its floodplain. Due to the distance between the project area and most in-town viewers, the landscape appears as fine or smooth-textured land, with occasional rough-textured cliffs, rock outcrops, and some curvilinear dirt roads. The color of the mountains is mostly gray, with blue to purple tints that vary with the time of day.

3.2.1.8.2 Vegetation. Vegetation (primarily clumps of creosote bush) on the project area is generally sparse and evenly distributed; from a distance, it appears fairly smooth and is not distinguishable as a separate visual resource from the landform on which it grows. No distinct lines are formed by the vegetation communities on the project area; rather, the vegetation appears to flow continuously over the landscape. During the growing season(s), the vegetation lends an overall olive-green tint to the landscape of the project area contrasting with the bright greens of the cotton fields and golden yellows of the wheat fields visible in the fore-middleground views. Although the Gila River lies in the fore-middleground, and cannot be seen from view points in town, the riparian vegetation along its banks is clearly visible from this viewpoint and provides a curvilinear greenbelt that helps to define the interface of fore-middleground with background views of the project area.

3.2.1.8.3 Structures. Existing tanks and buildings associated with former mining operations are visible on the lower elevations of the project area as tan-colored cylinders, rectangles, or squares. These structures form short horizontal and vertical lines. Curvilinear light gray lines are formed by the existing dirt roads. No structures protrude above the horizon at the crest of the Gila Mountains. Square, rectangular, and odd-shaped structures in the fore-middleground are primarily related to agricultural land uses and include tan buildings, gray-colored tanks, red and green farm equipment and machinery, and tan-colored power poles.

3.2.1.8.4 VRM Classification. The Safford District RMP (BLM 1991) designated the Gila Mountains a Visual Resource Management (VRM) Class III[4] area (see Appendix C for definition of classes). The RMP also designated lands south of the Gila Mountains VRM Class IV. The RMP, however, did not define the boundary between VRM Class III and Class IV in the vicinity of the project area. The BLM's VRM Manual states that "the approved VRM objectives shall result from, and conform with, the resource allocation decisions made in RMPs "(VRM Manual 8400.06 policy A.2, BLM 1984). For the purposes of this analysis, BLM has determined that the lands in the project area should be managed by VRM Class IV objectives for the following reasons: the project area is located in the foothills and alluvial fan terrace lying south of the Gila Mountains; the RMP did not withdraw public lands in the Gila Mountains from mineral entry; the RMP acknowledges the existence of mines and ore bodies in the Safford Mining District; and the RMP predicts development of mines in the mining district. Class IV objectives would conform with other resource allocation decisions of the RMP and would be consistent with the visual characteristics of open pit copper mining.

3.2.1.8.5 Nighttime Lighting. Other than the few existing structures on the project area near Site No. 2 that have exterior lights, there are no nighttime activities currently on-site that illuminate the project area. In general, nighttime views of the Gila Mountains from town show a dark, unlit scene in which the project area cannot be discerned. In part, this is because scattered light from exterior lights in town and at the prison

[4] Under the BLM's Visual Resource Management (VRM) system, public lands are designated as one of four classes, depending upon the property's natural scenic value. Classes I and II apply to areas with the greatest scenic value; Class III to areas with moderate scenic value; and Class IV to areas with the least scenic value (BLM 1984; see Appendix C for the management objectives of Classes I through IV).

on the east side of town in the fore-middleground view obscure the few, small, exterior building lights that currently exist on the project area. It should be noted that the ability of the viewer to discern nighttime views of the Gila Mountains themselves varies with moonlight conditions; on moonlit nights, the Gila Mountains are silhouetted against the night sky and appear as a solid black landform with an undulating crest. On moonless nights, the Gila Mountains and sky merge into a solid dark flat "wall" with no discernible land/water, vegetation, or structural features.

3.2.1.9 Hazardous Materials

A Phase I Environmental Site Assessment for potential environmental liability of the public lands proposed for the Project was conducted (Zenitech 1998a). The assessment was conducted in accordance with American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, E 1527, and involved aerial and site reconnaissance, review of public agency records and applicable federal, state and local records, and personal interviews. The results of this investigation for potential environmental liabilities are as follows (ibid):

- A review of agency databases indicated that none of the project area is located on or within one mile of a federal National Priority List site or an Arizona Water Quality Assurance Revolving Fund (WQARF)[5] site.
- One zipACIDS[6] site, the San Juan Mine zipACIDS site (EPA ID AZ0000309203), was located on or within one mile of the project area. This site is located primarily on existing PD-owned land, with a portion of the site on the selected lands. The zipACIDS list is a compilation of locations, sorted by zip code, subject to investigation under the State WQARF program and the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for possible contamination of soil, surface water, or groundwater. Inclusion of any facility or site on this list *does not* mean that the location is contaminated, is causing contamination, or is in violation of state or federal statutes or regulations.
- No Resource Conservation and Recovery Act (RCRA) transport, storage, or disposal facilities are located on or within one mile of the project area.
- No Emergency Response Notification System (ERNS) sites are located on or in the vicinity of the project area.
- No registered Underground Storage Tanks (UST) sites are located on the project area or on adjacent properties. March 13, 1998
- No Leaking Underground Storage Tanks (LUST) sites are located on or within 0.5 mile of the project area.
- No open or closed landfills are located on or within 0.5 mile of the project area.

PD was aware of the status of the San Juan Mine as a zipACIDS site when it purchased the mine in 1994 from a consortium of private owners. Upon acquisition of the property, PD initiated voluntary clean up activities on remedial disturbed areas that involved removal and disposal of tires, scrap metal, pipe, trash

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[5] This is a state "Superfund" program which focuses on groundwater quality.

[6] Arizona CERCLA Information and Data System.

and other debris that remained from previous mining and leaching activities conducted by the former operators.

Additionally, PD contracted with a consultant to design and oversee the installation of a stormwater management system, which includes lined channels and pipe drains to divert stormwater flows from the northern area of the leach stockpiles to the existing open pit mine. While this drainage system was being installed, an existing, unlined leach collection pond downgradient from the leach stockpiles was converted to a lined stormwater collection and evaporation pond. To do this, a trench was dug down to bedrock between the stockpiles and the pond. The trench acted to intercept and temporarily store surface and subsurface stormwater flowing from the stockpiles to the pond. The pond area was allowed to dry up, then it was partially excavated, contoured, and lined with a composite liner system consisting of a sublayer of a minimum of six inches of compacted clay overlain by a high density polyethylene (HDPE) synthetic liner of 60 mil thickness. The liner was extended to the interception trench and draped down against the downgradient wall of the trench. The trench was then backfilled with gravel, and six shallow reclaim wells were installed to pump intercepted stormwater seepage from the ditch into the lined pond to be evaporated. The Arizona Department of Environmental Quality (ADEQ) has determined that these improvements to the existing leach collection pond at San Juan will be subject to the Aquifer Protection Permit review process and will be treated as a new facility.

3.2.2 Physical Resources

3.2.2.1 Local Climate

Climate in the Safford Valley is temperate and semi-arid, with a growing season of about 200 days per year (Sellers and Hill 1974). The average daily maximum and minimum temperatures are 80.8° and 47.7°F, respectively; recorded temperatures range between 7° and 114°F. Winters are warm and dry; summers, hot and somewhat wetter. Average annual precipitation is 9.8 inches; the evaporation rate is high. A mountain range, the over 10,000-foot-high Pinaleños, about thirteen air miles to the southwest of the City of Safford, produces a rain-shadow effect in which much of the winter precipitation falls on the windward side of the mountains before reaching Safford. Summer precipitation in the form of thunderstorms originates from the Gulf of Mexico and represents more than half the annual total rainfall received. The Gila Mountains, with maximum elevations exceeding 6,000 feet and a southeast-to-northwest orientation, serve to funnel summer thunderstorm activity northwestward down the valley. Winds measured in the project area during 1995-1996 blew predominantly from the west northwest and northwest (41.3 percent of measurements) and secondarily from the east and east southeast (19.8 percent of measurements) (Class One Technical Services 1997). This pattern is characteristic of drainage either up or down the Safford Valley. Such winds usually occur during the day at average or above average speeds. They tend to be more turbulent than nighttime winds, exhibiting greater potential for dispersion of pollutants. At night, winds most often blow at low speeds down the slope of the Gila Mountains from the east or east-northeast. Wind speeds during 1995-1996 averaged 15.3 feet (4.6 meters) per second (ibid.)

3.2.2.2 Air Quality

3.2.2.2.1 Criteria Pollutants.[7] Class One Technical Services Inc., of Albuquerque, New Mexico, conducted ambient air quality impact modeling for the project area (Class One Technical Services 1997). Four criteria pollutants that might reasonably be expected to emanate from the proposed mining operations, particulate matter (PM_{10}), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and carbon monoxide (CO), were assessed at the "process boundary"[8] (Figure 3-4) and at four special receptors. One of these receptors was placed in each of two Class I areas (the Galiuro and Gila wildernesses); another was placed in the City of Safford; and another on the San Carlos Apache Reservation boundary. In addition to the four criteria pollutants, one compound from the Arizona Air Quality Guidelines list, sulfuric acid (H_2SO_4) mist, was assessed.

Background levels for each of the modeled pollutants are summarized in Table 3-8. At the process boundary, background PM_{10} concentrations of 12.1 and 25.9 $\mu g/m^3$ were used for modeling annual and 24-hour averaging periods, respectively. Background NO_2 concentrations were assumed to be negligible in the model because no major NO_2 sources exist in the area. Background levels for SO_2, CO, and acid mist (H_2SO_4) were also assumed to be negligible. No information on background levels of H_2SO_4 mist was given (Class One Technical Services 1997). No conformity analysis was necessary as the project area is located in an attainment area for criteria pollutants.

3.2.2.2.2 Class I Airsheds. Although under Clean Air Act regulations, the Project is not large enough to be subject to visibility analysis, PDSI voluntarily conducted a visibility analysis to determine if visual impacts would occur for views within nearly Class I airsheds. A Class I airshed is a management designation for some, but not all, national parks, monuments, wildernesses, primitive areas, preserves, recreational areas, wild and scenic rivers, wildlife refuges, and lakeshores and seashores. Under the Clean Air Act regulations, the proposed Project is not allowed to further degrade the atmospheric visibility for any Class I airshed within 100 kilometers (62 miles) of the project (40 CFR 50).

Figure 3-5 depicts the only two Class I airsheds within a 100-kilometer (62-mile) radius of the project area: the Galiuro Wilderness in the Coronado National Forest, Arizona, and the Gila Wilderness in the Gila National Forest, New Mexico. The closest boundary of the Galiuro Wilderness to the project area lies about 66.6 kilometers (41.4 miles) to the southwest. This wilderness is approximately 19 miles long and approximately 9 miles wide at the widest point. It consists of a northwest-southeast-trending mountain ridge dissected by two separate ridges in the north by Rattlesnake Creek and in the south by Redfield Canyon. The closest boundary of the Gila Wilderness is approximately 85 kilometers (52.8 miles) (measured in a straight line) east-northeast of the project area. The terrain along this straight line is rough and broken. It crosses several major river drainages, canyons, and mountains, rising to approximately 6,000 feet, approximately 1,800 feet above the average project area elevation. The highest elevation at the Gila Wilderness boundary is approximately 7,000 feet (Class One Technical Services 1997).

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[7] Criteria pollutants are the six compounds most commonly associated with degraded air quality and for which the EPA has formulated National Ambient Air Quality Standards (NAAQS). The pollutants include the four compounds analyzed in this study plus lead and ozone. Typically, modeling for lead and ozone is conducted only in urban areas, where automobile and industrial emissions often result in concentrations of lead and ozone large enough to significantly degrade air quality. Precursors to ozone include nitrogen oxides (No_x), which were analyzed in this study.

[8] ADEQ policy for air permitting requires the delineation of a process boundary, a perimeter within which public access is reasonably limited and outside of which public access is not reasonably limited. Public exposure to airborne pollutants is assumed to occur only in areas where public access is not reasonably limited (Class One Technical Services 1997).

Table 3-8. Summary of Existing Air Quality Conditions in the Project Area

Pollutant	Location	Averaging period	Background level	Source of background level estimate
PM_{10}	process boundary	Annual	12.1 µg/m³	Montezuma Castle‡ particulate monitoring site
PM_{10}	process boundary	24-hour	25.9 µg/m³	Montezuma Castle‡ particulate monitoring site
PM_{10}	City of Safford	Annual	40 µg/m³	annual average for 1996 at City of Safford monitoring station
PM_{10}	City of Safford	24-hour	90 µg/m³	2nd highest 24-hour average for 1996 at City of Safford monitoring station
PM_{10}	other special receptors*	Annual	≤ 12.1 µg/m³	Montezuma Castle‡ particulate monitoring site
PM_{10}	other special receptors	24-hour	≤ 25.9 µg/m³	Montezuma Castle‡ particulate monitoring site
NO_2	all	all	negligible	no major NO_2 sources in the area
SO_2	all	all	negligible	no major SO_2 sources in the area
CO	all	all	negligible	no major CO sources in the area
H_2SO_4 mist	all	all	negligible	no major H_2SO_4 mist sources in the area

* other special receptors: Galiuro Wilderness, Gila Wilderness, and San Carlos Apache Reservation.
‡ Although ADEQ maintains a monitoring station in Safford, that station is in close proximity to a major highway and agricultural fields. Montezuma Castle monitoring station data were used because as background, it is more representative of the rural setting and elevation of the project site.
Source: Class One Technical Services 1997.

3.2.2.3 Geology

The project area lies along the northern margin of the Basin and Range Physiographic Province in Arizona. This province covers about a third of the state south of the imaginary diagonal line that runs from the head of Lake Mead in the northwest down to the vicinity of the Gila River's entry into Arizona in the southeast (Nations and Stump 1981). The Basin and Range is characterized by heavily eroded, northwest-trending, elongated mountain ranges separated by broad valleys. The mountains are tilted blocks of often structurally deformed rock bounded by faults, and the valleys are intermontane basins that have been filled to great depths by sediments washed down from the adjacent eroding mountain ranges. If a stream has flowed through the valley or a lake formed, the basin fill could also include floodplain or lacustrine deposits. Both the mountain ranges and the deep basins were created during the Tertiary Period when the earth's crust stretched in this region, causing extensive movement along pre-existing and newly created fault zones. The blocks of rock between the faults moved and tilted, some slipping downward (called normal faulting) thousands of feet along the faults to form deep basins. The tilted blocks left in high relief formed the mountain ranges. The project area is located on the lower slopes of one of these northwest-trending mountain ranges, the Gila Mountains.

3.2.2.3.1 Local Geology. Dames & Moore (1997a) defines five lithologic (rock or sediment) units in the project area. Beginning with the oldest, they are the 1) Safford Volcanics,[9] 2) quartz monzonite-granodiorite porphyry, 3) Gila Mountain Volcanics, 4) Lower Basin Fill, and 5) recent alluvium (see Figure 3-6 for surface geology and Figure 3-7 for cross-sectional view of the project area). The oldest lithologic unit, the Safford

[9] Called the Safford Metavolcanics by Langton and Williams (1982). Langton and Williams also recognized an overlying younger unit, the Baboon Metavolcanics (a postmineral andesite), in the project area. Dames & Moore (1997a) has subsumed the Baboon Metavolcanics into their Safford Volcanics unit.

Volcanics, commonly referred to as the "premineral andesite," dates from the Late Cretaceous-Paleocene (Laramide age). It is composed primarily of andesite that was later (during the Paleocene and Eocene) intruded by the dikes, sills, and stocks of the second lithologic unit, the quartz monzonite-granodiorite porphyry. This porphyry is the mineralizing unit responsible for the copper deposits in the project area. The deposits include both copper oxides and copper sulfides, which are commercially processed using different extraction techniques. About 75 percent of the known copper ore in the Safford Mining District has been found along fractures in the Safford Volcanics, and about 25 percent has been found in the porphyritic intrusions themselves. The Safford Volcanics and some porphyritic rocks are exposed at the surface in the northeastern part of the project area, as depicted in surface geology map (Figure 3-6).

The third lithologic unit is the younger, unmineralized Gila Mountain Volcanics, which are Miocene-to-Late-Pliocene-age rocks composed of basalts, tuffs, rhyolites, and agglomerates. Located only in the western portion of the project area, these volcanics are overlain, for the most part, by the fourth unit, the Lower Basin Fill sediments of Pliocene and Early Pleistocene age. This unit comprises semiconsolidated to consolidated conglomerates washed down in great alluvial fans from the eroding Gila Mountains, and finer-grained lacustrine deposits left behind by a lake that once filled the Safford Basin. Basin Fill is estimated to have reached depths of 1,500 feet or more. Beginning in the Late Pleistocene, the Gila River began eroding the fill, carving the alluvial fans on both sides of the Valley into a series of more gently graded terraces. The lowest terrace face appears as a line of bluffs bordering each side of the current Gila River floodplain.

Overlying all earlier units in various locations throughout the project area are deposits of the fifth unit: recent alluvium. This is unconsolidated material has been deposited since the Pleistocene, primarily by runoff in wash channels and floodplains. Some of this recent material also takes the form of relatively small alluvial fans superimposed on the terraces.

Outside the project area, a sixth lithologic unit is recognized. This is the Upper Basin Fill, a fine-grained floodplain deposit that overlies the Lower Basin Fill on the Safford Valley floor. These deposits began to form only after the ancient lake had filled in and a through-flowing river was established.

Three major fault systems have been identified in the project area: the Butte (Foothill) Fault, the Valley Fault, and the Southwest Fault (Figures 3-6 and 3-7). Several smaller faults and sheer zones are present as well. The Butte Fault is a regional, northwest-trending, Basin and Range normal fault. Movement along this fault has caused rocks to the southwest to slip downward relative to the rocks to the northeast. Consequently, rock layers that were actually deposited one on top of the other are now exposed at the surface side-by-side; the Gila Mountain Volcanics and Lower Basin Fill southwest of the fault are adjacent to the older Safford Volcanics northeast of the fault. Where the Butte Fault cuts across the Dos Pobres copper deposit, it has displaced the southwestern one-half to one-third of the deposit downward some 3,000 feet relative to the northeastern part (PDSI 1997). The proposed Dos Pobres pit will straddle the Butte Fault. Gila Mountain Volcanics will be exposed in the pit's southwestern walls, and Safford Volcanics and quartz monzonite porphyry will be exposed in the northeastern walls. In contrast, the ultimate San Juan pit will lie entirely to the northeast of the Butte Fault, so only Safford Volcanics and quartz monzonite porphyry will be exposed in its walls. All the rocks that will be exposed in the walls of both the Dos Pobres and San Juan pits are relatively low in hydrothermal sulfide concentrations, which are acid-generating, and high in carbonate minerals, which are alkaline.

The Valley Fault, a west-northwest striking normal fault, lies generally southwest of the Butte Fault but angles toward it. The two faults intersect roughly a mile south of the San Juan pit (Figure 3-6). The wedge of rock between the faults has slid downward relative to the rocks on either side. Such a down-thrown feature is called a graben (Figure 3-7). The rocks within the graben, consisting of Lower Basin Fill and Gila Mountain Volcanics, are highly fragmented as a result of this downward movement, and are generally more

permeable than the older Safford Volcanics. South of the Valley Fault, the Lower Basin Fill thickens substantially, reaching depths of 1,000 feet in the south westernmost part of the project area.

The Southwest Fault, located about three miles southwest of the Valley Fault and roughly parallel to it, is a normal fault that probably dips toward the southwest. The fault location is inferred from water quality and other geological data, but is not exposed at the surface.

3.2.2.3.2 Mineral Potential. Mineral resources are defined as concentrations of naturally occurring solid, liquid, or gaseous materials in or on the earth's crust in such form that economic extraction of a mineral resource is currently or potentially feasible (Wahl 1997a). Wahl evaluated the selected lands for the potential occurrence of mineral resources in the form of both disseminated copper and related mineralization (e.g., molybdenum, lead, zinc, gold, and silver), as well as underground mineral resources, as one consideration in the appraisal process for the selected lands. His study area comprised three blocks of selected lands labeled Dos Pobres, San Juan, and Lone Star (Figure 3-8). Areas corresponding to one-square-mile land sections within these blocks were evaluated for mineral potential. These areas are labeled alphabetically in Figure 3-8.

After reviewing extensive exploration data collected by PD for portions of the selected lands, and studying surface exposures, Wahl (1997a) determined that the potential[10] for accumulation of disseminated copper deposits suitable for open-pit mining in most of the selected lands is low at a moderate level of certainty (Table 3-9). However, parts of the selected lands are classified as having moderate to high open-pit mineral potential at moderate to high levels of certainty, as described below. The underground mineral potential was judged to be low to moderate at moderate levels of certainty (Table 3-10).

Wahl (1997a) reported that primary sulfide mineralization appears to be well developed below leachable ore in the Dos Pobres and Lone Star deposits, but not in the San Juan deposit. Because development of sulfide mineralized deposits is seriously constrained by economic and environmental considerations at this time, evaluation efforts were directed primarily toward leachable (oxide) mineral deposits.

The only selected lands determined to have high open-pit mineral potential at a high level of certainty occur in the San Juan block. They include approximately 190 acres of selected lands (about 1.1 percent of the total selected lands) immediately surrounding the San Juan pit in parts of areas H, I1, O, and P (see Figure 3-8). These areas represent leachable porphyry copper mineralization of the San Juan deposit on the order of approximately 133 million tons, roughly 32 percent of the total estimated 411 million tons of the San Juan deposit's leachable ore.

[10] "Potential" refers to the likelihood for occurrence of a concentration of one or more mineral resources. This mineral potential evaluation uses five categories: zero (0), low (L), moderate (M), high (H), or not determined (ND), with four levels of certainty (A-D), defined as follows: A = available data are insufficient and/or cannot be considered as direct or indirect evidence to support or refute the possible existence of mineral resources within the respective area; B = available data provide indirect evidence to support or refute the possible existence of mineral resources; C = available data provide direct evidence but are qualitatively minimal to support or refute the possible existence of mineral resources; D = available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources.

Table 3-9. Open-Pit Mineral Potential of the Selected Lands (refer to Figure 3-8)

Area	Mineral Potential	Level of Certainty*
Dos Pobres Block		
C, D, G, M, N, R, S, T, U, AA, AB, & AC; parts of A, B, E, & F	Low	C
parts of A, B, E, & F	Moderate	B
Lone Star Block		
I2, J, L, AE, AF, AG, AH, AJ, AK, AL, AM, & AN; parts of K, & AI	Low	C
parts of K & AI	Moderate	B
San Juan Block		
X & AD; parts of H, I1, O, P, Q, V, W, Y, & Z	Low	C
parts of P, V, W, Y, & Z	Moderate	B
parts of H, I1, O, P, & Q	Moderate	C
parts of H, I1, O, & P	High	D
parts of H, P, & Q (Joy mineralization area)	High	C

* Level of Certainty key: A through D, with D = highest certainty and A = lowest certainty.
Source: Wahl 1997a.

Table 3-10. Underground Mineral Potential of the Selected Lands (refer to Figure 3-8)

Area	Mineral Potential	Level of Certainty*
Dos Pobres Block		
A, B, C, D, E, F, M, N, R, S, T, U, AA, AB, & AC; part of G	Low	C
part of G (Essex area)	Moderate	B
Lone Star Block		
J, K, L, AE, AG, AH, AJ, AL, AM, & AN; parts of I2, AF, AI, & AK	Low	C
parts of I2 & AF (including Blue Jay Mine area); AI, & AK	Moderate	B
San Juan Block		
H, I1, O, P, Q, V, W, X, Y, Z, & AD	Low	C

* Level of Certainty key: A through D, with D = highest certainty and A = lowest certainty.
Source: Wahl 1997a.

Another area of the selected lands with high open-pit mineral potential, referred to as the Joy area mineralization, is located west and south of the San Juan deposit. Although not well tested, the Joy area mineralization covers approximately 75 acres (about 0.4 percent of the selected lands) and contains an estimated 150 million tons[11] of mineralized material overlain by approximately 112 million tons of unmineralized development rock.

[11] This estimate is based on a model that assumes a tonnage factor or 12.4 cubic feet per ton and that mineralization is uniform and continuous within the modeled blocks. Much additional drilling is required in the Joy area prior to a determination that an ore reserve has been established at this location.

Three small areas of the selected lands in the Dos Pobres and Lone Star blocks exhibit moderate potential for accumulation of limited underground copper and other metal resources at a low level of certainty. These areas are described below (refer to Table 3-10), but no acreage has been estimated for the mineralized areas.

- Essex area. This portion of area G in the Dos Pobres block represents Dos Pobres mineralization down-dropped to the southwest by the Butte Fault. Any potential underground development of this area would likely be tied to potential future deep open-pit development of Dos Pobres sulfide mineralization on existing patented land.
- Lone Star Block. Moderate potential at a relatively low level of certainty is assigned along an east-northeast trending fault and dike system (in parts of areas AI, AK, AF, and I2) where geologic conditions and limited surface geochemical data indicate a permissive environment for accumulation of copper plus precious metal mineral resources in steep veins.
- Blue Jay Mine area. Moderate potential for the accumulation of small-scale underground mineral resources is assigned to a portions of areas AF and I2 containing narrow veins of the Blue Jay mine west of Lone Star. Copper oxides are present locally along the veins, and concentrations of copper and other metals could exist at depth.

Wahl (1997a) also reviewed the potential of the selected lands for other metallic and non-metallic minerals, including placer gold. This evaluation is summarized in Table 3-11.

Table 3-11. Summary of Metallic and Non-Metallic Mineral Resource Potential on the Selected Lands

Mineral/Resource	Potential
coal, oil, gas, sodium, and potassium	not prospectively valuable
uranium and thorium	low potential
geothermal resources	portions considered favorable for development of low-temperature geothermal resources
non-metallic and industrial minerals (e.g., limestone, sandstone)	not known to exist in commercial quantities
common variety minerals (e.g., sand, gravel, decomposed organic, riprap rock, clays)	localized deposits present
placer gold and all other metallic minerals	low potential

Source: Wahl 1997a.

3.2.2.4 Soils

The sediments that cover large portions of the project area are derived from the basalt, andesite, and rhyolite bedrock of the Gila Mountains. These sediments have been deposited on the broad Basin Fill terraces, in the ephemeral wash channels and floodplains, and on the rocky upper slopes that topographically characterize the project area. The Natural Resource Conservation Service (NRCS), formerly called the Soil Conservation Service (SCS), has identified the following soil types in each of the major topographic divisions (SCS 1970, 1981).

- **Lower Alluvial Fan Terraces.** On the lower terraces, sediments form level to gently sloping, broad, coalescent plains on bluffs overlooking the floodplain of the Gila River. This topography typifies the southernmost portion of the project area where the proposed compactible soil source area is located. These soil units in this area are all coarse-grained, containing and covered by large amounts of gravel. The soils tend to be deep. They are largely alkaline, particularly in the subsoils, and often have lime-cemented hardpan substrates. All the soils are well drained; permeability is very slow in the lime substrates, moderately slow in the Continental and Pinaleno soils, and moderately rapid to rapid in the Gravelly Alluvial Land. Available water holding capacity ranges from very low to moderate. All the soils present severe limitations for most recreational and building uses. Their suitability for roadfill ranges from poor to good; compaction characteristics are rated fair to good. Their suitability for top soil ranges from poor to fair (SCS 1970).

- **Upper Alluvial Fan Terraces.** The upper alluvial fan terraces typify the middle reaches of the project area in a band stretching diagonally from the northwest to the southeast. Several major components of the proposed mining activity will be located on these terraces. The soil units in this area contain and are often covered by coarse sediments: cobbles, gravel, and sometimes hardpan fragments. They tend to be deep in the lower reaches of the alluvial fans where the slopes are gentler, and shallow to very shallow in the upper reaches where the slopes are steeper. The soils, particularly the subsoils, are largely alkaline, with several units forming a substratum of silica- and lime-cemented hardpan at depths ranging from 40 inches in the Artesia series to two inches or less in the Orthents. All the soils are well drained; permeability is slow to moderately slow; available water capacity ranges from very low to moderate. All the soils present severe limitations for most recreational and building uses. Their suitability for roadfill ranges from poor to fair. Their suitability for top soil is uniformly poor. Their ability to support grasses is very poor; to support herbaceous plants and shrubs, generally fair; and to support rangeland wildlife habitat, poor to fair (SCS 1981).

- **Ephemeral Wash Beds and Floodplains.** Soil in this area has deposited in and alongside the numerous ephemeral washes that run diagonally across the project area and across both planned mining sites. This soil unit is deep and well drained. Permeability is rapid, and the available water capacity is very low to low (SCS 1981). Several facilities of the proposed mining activities will be located on patches of this soil type associated with Talley, Cottonwood, and Peterson Washes.

- **Rocky Upper Slopes.** Soil units in the rocky slopes, hills, and escarpments in the northeastern portion of the project area contain and are often covered by cobbles and gravel. They tend to be very shallow and shallow, with the exception of Limpia, which is deep. All the soils tend to be alkaline. They are well drained; permeability is slow to moderately slow; available water capacity ranges from very low to moderate. All the soils present severe limitations for most recreational and building uses. Their suitability for roadfill and topsoil is poor. Their ability to support grasses is very poor, and their ability to support herbaceous plants, shrubs, and rangeland wildlife habitat is fair to poor (SCS 1981).

3.2.2.5 Groundwater

The project area is located in the Gila sub-basin of the larger Safford groundwater basin. This sub-basin covers 1,642 square miles of the northwest-trending Safford Valley and the mountain ranges on either side. The Gila and Peloncillo Mountains border the sub-basin on the northeast; the Pinaleño and Santa Teresa Mountains border on the southwest. Groundwater under the valley floor enters the Gila sub-basin from the southeast and exits to the northwest, following the same gradient as the Gila River on the surface. This through-flow is augmented by groundwater that drains down gradient from the mountains on both sides of the valley floor (Figure 3-9) (Dames & Moore 1997a).

In the immediate project area, groundwater generally flows from topographically high elevations in the Gila Mountains southwestward toward the valley floor. It moves through three hydrogeologic units that correspond to lithologic units. They are the 1) Safford Volcanic Unit, 2) Gila Mountain Volcanic aquifer, and 3) Lower Basin Fill aquifer (Figure 3-9). Outside and downslope from the project area on the Safford Valley floor, an additional unit, the Upper Basin Fill, overlies the Lower Basin Fill aquifer. In the project area, northeast of the Butte Fault, only the oldest hydrogeologic unit, the Safford Volcanic Unit, is present and available as a source of pumped groundwater. This unit contributes groundwater to both the Dos Pobres and San Juan pit sites. Southwest of the Butte Fault, in the graben between the Butte and Valley Faults, the Gila Mountain Volcanic aquifer is the primary potential source of groundwater. It contributes groundwater to the Dos Pobres pit site but not to the San Juan pit site. The third aquifer, the Lower Basin Fill, is located primarily south-southwest of the Southwest Fault. It appears not to contribute to the Dos Pobres pit site, and definitely does not contribute to the San Juan pit site (ibid.).

To obtain data on groundwater and aquifer characteristics, 15 new monitor wells and 17 new piezometers (both in the AP-series) were installed in the project area during hydrogeologic field investigations conducted in 1995-1996 (Dames & Moore 1997a). These new wells joined 18 existing monitor wells in the project area (for a total of 33 monitor wells) and 24 existing piezometers (for a total of 43 piezometers (Figure 3-10). During the same time period, 21 groundwater exploration wells (GI-series) were installed. The GI-series includes three pilot wells (GI-P1, GI-P2, and GI-P4) located between the Butte and Valley Faults (in the graben area) and one pilot well (GI-P3) located just south of the Valley Fault (Figure 3-11). The pilot wells produced data on aquifer characteristics, groundwater elevations, and drawdown characteristics.

Aquifer characteristics including transmissivity, storativity, and hydraulic conductivity have been estimated from pumping test data (Dames & Moore 1997b). The Safford Volcanics and the Gila Mountain Volcanics have both undergone aquifer characterization tests, but demonstrate highly variable transmissivity and storativity values depending upon the degree of fracturing in the well area. In general, the younger Gila Mountain Volcanics exhibit higher porosity/permeability and are more fractured than the older Safford Volcanics. Difference in hydraulic conductivity between the Safford Volcanics and Gila Mountain Volcanics indicates hydraulic connection between them is limited. In the project area, the Lower Basin Fill is not saturated and has not been tested. Table 3-12 presents aquifer characteristics.

Table 3-12. Aquifer Characteristics in the Project Area

Aquifer	Storativity (1/ft)	Transmissivity (ft^2/day)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Confined/ Unconfined
Safford Volcanic Unit (well GI-P3)	0.0005 - 0.17	1,000 - 6,000	600	13 - 70	confined
Gila Mountain Volcanic Aquifer (well GI-P2)	0.0004 - 0.03	5,000 - 40,000	1,200	33 - 254	semi-confined to confined
Lower Basin Fill Aquifer (well AP-27)	unknown	21,000 - 40,320,000	0 - ≥115	133 - 245	unconfined

Source: L. Person, Dames & Moore, pers. comm.

Groundwater elevations in the project area are highest in the northeast where topographic elevations are highest, and lowest in the southwest where topographic elevations are lowest (see Figure 3-11 for the observed water table). Northeast of the Butte Fault, groundwater elevations range from 3,500 to 4,300 feet above mean sea level (msl), and southwest of the fault, they range from 3,000 to 3,500 feet above msl. In the graben, between the Butte and Valley faults, groundwater elevations range from 3,250 to 3,260 feet above msl. While the groundwater table in the project area tends to follow the topography, the distribution of areal recharge and the hydraulic conductivity (permeability) of the underlying aquifer materials strongly influences groundwater elevation and groundwater gradients, i.e., the ratio of vertical movement to horizontal movement (measured in feet per foot [ft/ft])(Dames & Moore 1997a).

Northeast of the Butte Fault, areal recharge is higher in the Gila Mountains, and the Safford Volcanic Unit has low permeability; consequently, groundwater table gradients are relatively steep, ranging from 0.02 to 0.4 ft/ft. Depth to groundwater ranges from ground surface to several hundred feet below ground surface (bgs). Water levels are typically shallow near springs and seeps but range to greater than 700 feet bgs. Between the Butte and Valley faults, in the graben area, groundwater elevations are very consistent at approximately 3,235 feet above msl, varying with topography between roughly 600 and 750 feet bgs (Dames & Moore 1996b). South of the Southwest Fault, depth to groundwater is between approximately 100 and 500 feet bgs.

Recharge of groundwater in the project area occurs as infiltration of precipitation, with the greatest recharge occurring in the higher elevations of the Gila Mountains. The main area of groundwater recharge near the proposed mine sites is expected to occur along a major break in slope of the Gila Mountains located north of the pit sites. Annual precipitation is estimated to be more than 18 inches in the mountains and 12-15 inches in the project area (Dames & Moore 1996b). A real recharge along the mountain front has been estimated to range from 0.115 in/yr in the higher portions of the Gila Mountains to as much as 1.90 in/yr along the mountain front where both precipitation and runoff from the mountains recharge fractured volcanic rocks and unconsolidated sediments (Dames & Moore 1997g). Water enters the groundwater system in the Safford Valley down-gradient of the mine from several sources. An estimated 4,871 af/yr enters from the Gila Mountains, 32,771 af/yr as lateral inflows of groundwater from adjacent basin areas, and infiltration of 40,094 af/yr from the Gila River (Dames & Moore 1997g).

Discharge of groundwater in the project area occurs naturally at four springs: Bryce Spring (located just outside the northern boundary, but its discharge flows into the project area) and Hackberry, Cottonwood, and Walnut Springs (all within the project area) (see Figure 3-1). There are 97 wells in the project area, but they are used only for groundwater measuring, sampling, and exploration, and do not discharge significant quantities of water. Discharge of groundwater in the Safford Valley from the Lower Basin Fill aquifer occurs primarily as pumping for irrigation and seepage into the Gila River (Dames & Moore 1997a). The surface diversion is not sufficient to irrigate all the crops grown, and groundwater is pumped from wells for direct irrigation as well as directly into the canals distributing the surface diversion. Considering that the irrigated crops consumptively use 153,000 af/yr (94,789 gpm), and 100,000 af/yr (61,954 gpm) is supplied by diversions from the Gila River, the estimated net groundwater withdrawal for irrigation is 52,683 af/yr (32,639 gpm) (Dames & Moore 1997g). The estimated outflow from the groundwater system to the Gila River is 21,161 af/yr (13,110 gpm), and an additional ground water outflow to the northwest (Figure 3-9) of 3,697 af/yr (2,290 gpm), comprise the remainder of the outflows from the groundwater system (Dames & Moore 1997g).

3.2.2.5.1 Groundwater Quantity. The volume of groundwater moving through the area tapped by new and existing pilot-wells[12] is estimated to be approximately 60 cfs (25,500 gpm or 40,353 af/yr) (Dames & Moore 1996). This groundwater is not uniformly distributed throughout the rock mass but moves through discrete fractures; therefore, only a portion is available to any given well.

Constant rate pump testing was conducted at the four pilot-wells to determine drawdown of the aquifer. Drawdown pumping from wells GI-P1, GI-P2, and GI-P4 appears to be confined by the Butte and Valley faults, which act as no-flow boundaries. The maximum spread of the cone of depression from GI-P3 after roughly 4.5 weeks of continuous pumping at 2,000 gpm (3,228 af/yr) is approximately 8,500 feet to the west-southwest. Spread of the cone of depression (i.e., drawdown) appears to be limited by the Valley Fault to the north, and, possibly, by the Southwest Fault to the south. The average production rate from each pilot-well through October 31, 1996, is provided in Table 3-13.

Table 3-13. Average Groundwater Production Rate from Four Pilot-Wells in the Project Area

Pilot well	Discharge Rate (gpm)	Drawdown (ft)	Pumping Period (weeks)
GI-P1	900 (1,453 af/yr)	21	2.44
GI-P2	2,000 (3,228 af/yr)	125	18.60
GI-P3	2,000 (3,228 af/yr)	204	4.46
GI-P4	3,200 (5,165 af/yr)	96	6.35

Source: Dames & Moore 1997b.

3.2.2.5.2 Groundwater Quality. Dames & Moore (1997a) collected groundwater quality data from 32 monitor wells in the project area, and from three springs (Bryce, Hackberry, and Cottonwood Springs). The objectives of water quality testing were to assess the availability of groundwater of suitable quality for use in the proposed mining operations (i.e., groundwater with a chloride concentration of less than 200 mg/L), and to provide data for environmental analysis. These data will serve as a baseline to project, and later measure, any effects of the proposed mining activities on groundwater quality.

Groundwater quality varies significantly throughout the Safford Basin. Water quality in the Floodplain Alluvial aquifer in the center of the Safford Valley is poor, generally declining from east to west. Electrical conductivity (proportional to total dissolved solids [TDS]) varies from 2,000 μmhos near Solomon to 8,000 μmhos near Pima. Chloride concentrations vary from 400 ppm to 1,600 ppm over the same area. Groundwater quality in both the Floodplain Alluvial aquifer and the Upper Basin Fill is influenced by upward leakage from the artesian Lower Basin Fill aquifer and by downward percolation of irrigation water. The Lower Basin Fill aquifer is high in TDS and elevated in temperature. Few wells penetrate this unit due to its poor water quality.

Groundwater quality generally improves toward the mountains on both sides of the valley. Water quality differs between the northeastern and southwestern parts of the project area, with the inferred Southwest Fault appearing to act as a divide for groundwater quality. Northeast of the Southwest Fault, groundwater is drawn from either the Safford or the Gila Mountain Volcanics, where water quality is generally good. The inorganic geochemistry of the groundwater tends to be characterized by sodium/potassium and carbonate/bicarbonate, with a relatively low total ion content. Fluoride concentrations generally are less than 1.0 mg/L. Observed concentrations of TDS, sulfate, and chloride are also comparatively low. TDS concentrations typically range from about 250 to 1,000 mg/L, but are generally less than 500 mg/L. Sulfate concentrations typically range

[12] As calculated using the Darcy equation.

from nondetectable (>5 mg/L) to more than 800 mg/L but are generally less than 300 mg/L. Chloride concentrations range from 5 mg/L to as high as 450 mg/L, but are generally less than 200 mg/L. Compared to the Gila Mountains Volcanics, the Safford Volcanics has a slightly higher sulphate content but lower calcium and magnesium concentrations.

Southwest of the Southwest Fault, where the Lower Basin Fill is the principal aquifer, groundwater is dominated by sodium/potassium, and, to a lesser extent, sulfate. Ion composition of groundwater in the Lower Basin Fill is markedly different from that of the volcanics. Total ion content is relatively high. Fluoride concentrations in groundwater from five monitor wells in the area range from 4.2 to 8.6 mg/L, exceeding the numeric Aquifer Water Quality Standard (AWQS) of 4.0 mg/L. Observed concentrations of TDS, sulfate, and chloride are also comparatively high. TDS concentrations range from about 1,100 to 2,400 mg/L, sulfate concentrations range from 220 mg/L to 4300 mg/L, and chloride concentrations range from 450 mg/L to 1,200 mg/L. Groundwater conditions throughout the project area are alkaline, with laboratory pH values ranging between 6.4 and 12.1. Values from all but one well were greater than 7.0 and most values ranged between 7.0 and 9.0.

Seven metals with numeric AWQS were detected in groundwater in the project area: arsenic, barium, cadmium, chromium, lead, mercury, and nickel (Table 3-14). Only nickel exceeded the numeric AWQS (0.1 mg/L), with a concentration of 0.12 mg/L in one of three samples from a single well. The concentration was 0.09 mg/L in the second sample, and no nickel was detected in the third sample. The other metals detected in the groundwater in the project area (aluminum, copper, iron, manganese, silicon, and zinc) do not have numeric AWQS.

Table 3-14. Metals with Numeric AWQS Detected in Groundwater in the Project Area

Metal	Numeric AWQS (mg/L)	Number of Wells with Detections	Number of Wells with Analytical Results That Exceed the Numeric AWQS
Arsenic	0.05	10	0
Barium	2.0	23	0
Cadmium	0.005	3	0
Chromium	0.1	9	0
Lead	0.05	4	0
Mercury	0.002	1	0
Nickel	0.1	1	1

Source: Dames & Moore 1997a.

Concentrations of nitrite exceed the numeric AWQS (1 mg/L, as N) in samples from two wells (2.0 to 2.4 mg/L, as N). Concentrations of nitrate, as total nitrate and nitrite, do not exceed the numeric AWQS. Cyanide was detected in groundwater from three wells, but at concentrations (0.01, 0.01, and 0.03 mg/L) well below the numeric AWQS (0.2, as free cyanide). Low concentrations (< 2.5 mg/L) of total petroleum hydrocarbons (TPH) were detected in samples from four wells. Most concentrations of total organic carbon (TOC) range from nondetectable to 7.8 mg/L, and are typically below less than 5.0 mg/L. Samples from six wells range between 13 and 110 mg/L for TOC. Gross alpha particle activity values range from 0 to 23 picocuries per liter (pCi/L), and samples from two wells exceeded the AWQS (15 pCi/L). Gross beta particle activity values range from 0 to 240 picocuries per liter (pCi/L), but are typically less than 10 pCi/L, and exceed the AWQS (15 pCi/L) in samples from two wells. Values for radium 226 and radium 228 are below the numeric AWQS of 5 pCi/L.

Several wells in the project area demonstrated elevated water temperatures, however, the distribution of warm water in the project area does not appear to correlate with high TDS, fluoride, or sulfate (Dames & Moore 1998f) and the geochemistry between these wells is distinct. For example, well GI-T18 (northwest of the Dos Pobres pit) has a temperature of 110°F and a TDS value of 280 mg/l and well AP-37 (along Cottonwood Wash south of the Dos Pobres pit) has a temperature of 98°F and a TDS value of 1600 mg/l. Groundwater in the area of the San Juan deposit is dominated by sulfate and is geochemically distinct from water in other parts of the project area (Dames & Moore 1997d); no elevated temperatures were observed in wells in this area. Previous studies conducted in the area of the Lone Star deposit located a borehole with highly mineralized thermal water with a temperature of 150°F and a TDS value of 4,555 mg/l. The borehole is probably associated with the Butte Fault. Thermal artesian waters encountered in wells such as at Watson Wash, located more than six miles southwest of the Dos Pobres mine, result from the presence of a thick clay layer in the upper part of the Lower Basin Fill. This geological stratum is not present at or below the water table elevation in the vicinity of the Dos Pobres mine.

3.2.2.6 Surface Water

The project area lies within the middle-Gila River watershed. The City of Safford does not draw water from the Gila River for municipal or industrial uses, depending instead on Bonita Creek, a tributary whose confluence is located approximately 16 miles upstream of Safford. The Bonita Creek watershed is separated from the project area by a ridge of the Gila Mountains.

The project area itself is drained by more than 150, primarily unnamed ephemeral washes (SWCA 1997e). Most of smaller washes feed into ten larger, named washes: Butler, Coyote, Watson, Talley, Cottonwood, Peterson, Wilson, Lone Star, and Tidwell, and Big Canyon Washes. The largest of these is Peterson Wash, which runs just west of the proposed San Juan pit. Drainages run generally from the northeast toward the southwest, ultimately flowing into the Gila River about seven miles downslope (see Figure 3-1). The lower elevations of the project area, in which there is little topographic variation, are subject to sheet flows, a phenomenon in which surface runoff flows in wide, shallow sheets rather than in channels.

The only other surface water in the project area comes from four isolated springs: Bryce Spring, Hackberry Spring, Cottonwood Spring, and Walnut Spring (Figure 3-1). The head of Bryce Spring is actually located just to the north of the project boundary, but its flow runs into the project area. Spring flow does not reach the Gila River but is used locally for watering stock. Bryce and Walnut Springs are located on BLM lands and Hackberry and Cottonwood Springs are located on PD patented land; all have been developed for stockwatering purposes.

3.2.2.6.1 Surface Water Quantity. Annual precipitation is estimated to vary from 9.8 inches in the City of Safford to more than 18 inches in the higher Gila Mountains (Dames & Moore 1996b). Precipitation in the project area is estimated to be 12-15 inches per year (ibid.). About half of this falls as light winter showers; the other half falls during summer thunderstorms. Summer high temperatures range between 100 and 115°F and winter lows range between 10 and 20°F (Dames & Moore 1997a).

The Gila River is the only perennial stream in the immediate vicinity, flowing through the Safford Valley at an annual average discharge of 477 cfs (about 345,000 af/yr), with a lowest annual mean of 101 cfs (79,500 af/yr) in 1951 and highest annual mean of 2,229 cfs (1,610,900 af/yr) in 1993 (USGS 1996). Consumptive use of water in the Safford Valley for agriculture is estimated to be about 153,000 af/yr, which is provided through river diversions and groundwater pumping (H. West, BLM, pers. comm.). This annual total water use represents nearly 44% of the average annual discharge of the Gila River. Surface flows in the Gila River have been allocated based on a system of priority surface water rights, which is currently subject to an ongoing adjudication in Maricopa County Superior Court.

The U.S. Geological Survey (USGS) reports that average annual runoff in the vicinity of the project area is approximately 0.2 inches.[13] Dames & Moore, in studying data from four gaging stations in the study region, calculated that the average annual runoffs for local watersheds in the project area is 0.22 inches for those areas below 5,000 feet elevation and 0.42 inches for areas above 5,000 feet (Dames & Moore 1996a). The difference between precipitation and runoff is attributable to infiltration and evapotranspiration. The estimated average annual runoff in the five largest washes in the project area is reported in Table 3-15.

Table 3-15. Average Annual Runoff Volume (af) for Five Washes in the Project Area

Butler Wash	Watson Wash	Talley Wash	Peterson Wash	Wilson Wash
267.2	138.8	119.2	254.8	79.5

Source: Dames & Moore 1996a.

3.2.2.6.2 Surface Water Quality. In *1996 Arizona Water Quality Assessment* [commonly referred to as the 305(b) report] (ADEQ 1996), surface water quality data are presented for 12.6 miles of the Gila River directly downstream from the project area, from the San Simon River to Peck Wash. The project area is tributary to this segment of the Gila River watershed. Based on a USFWS study conducted in 1990 of fish, water, and sediment contamination (King and Baker 1994), this segment of the Gila River was evaluated to be in "partial support"[14] of designated uses due to elevated levels of arsenic (in water), cadmium and thallium (in sediment), and copper and zinc (in fish). This segment is not classified as "Water Quality Limited."[15]

The average annual sediment yield in af/yr is reported for the five largest washes in the project area in Table 3-16.

Table 3-16. Average Annual Sediment Yield (af/yr) for Five Washes in the Project Area

Butler Wash	Watson Wash	Talley Wash	Peterson Wash	Wilson Wash
0.9	2.9	1.3	1.5	3.0

Source: Dames & Moore 1996a.

3.2.2.6.3 Pit Lakes. Lakes form in mine pits from three sources: precipitation, surface runoff and groundwater inflow through fractures in the rock walls. Water is lost from such lakes through evaporation and groundwater seepage. Water quality in a pit lake is a function of the quantity and quality of influent solutions, wallrock mineralogy, and chemical reactions within the lake. The water derived from high wall runoff flowing into a pit carries a dissolved mineral load resulting from weathering and oxidation of surface outcrops of mineralized rocks.

[13] Runoff is reported here as the depth of water that would uniformly cover the entire area of interest.

[14] Water bodies are assessed to be in "partial support" of designated uses if one or more uses are impaired, but none substantially. Narrative violations may occur seasonally (e.g., excessive algal blooms or weeds), and toxic spills or discharges may occur with nominal or short-term effects (ADEQ 1996).

[15] "Water Quality Limited" water bodies are assessed as having impaired uses that require more than existing technology and permit controls to achieve or maintain water quality standards (ADEQ 1996).

A small lake has formed in the existing San Juan pit, covering roughly seven percent of the pit surface. Walls of the pit exposed above the lake surface are composed of alluvial cover (8 percent), Safford Volcanics (45 percent), and quartz monzonite porphyry (roughly 46 percent). Of these rocks, seven percent are unmineralized and 93 percent are oxides. Acid-base accounting results for the rocks show that they are generally non-acid generating (PDSI 1996; WMCI 1998). This can be attributed to the absence of sulfides, the oxidation of which is the main source of acid rock drainage from mine workings. The water derived from high-wall runoff in the existing San Juan pit, based upon EPA 1312 testing, has a pH between 7.7 and 8.8 and meets BLM benchmark values (BLM 1996b) and AWQS for heavy metal concentrations (Water Management Consultants, Inc. 1997, 1998).

According to modeling results, the predicted water quality of the existing lake, through the natural mixing of runoff from the pit walls and groundwater, would be expected to have neutral to slightly alkaline pH levels and a dissolved metals load within BLM benchmark concentrations and AWQS (ibid.). The average measured pH (3.0), however, is much more acidic than the predicted value, and concentrations of aluminum (193 mg/L), copper (827 mg/L), iron (46 mg/L), manganese (109 mg/L), nickel (1.5 mg/L), zinc (21 mg/L), and sulfate (10,500 mg/L) are dramatically higher than predicted by several orders of magnitude. Other metal concentrations show no significant enrichment compared to predicted values. This inconsistency suggests the current lake chemistry is being determined by sources other than those considered in the modeling. The source of the acid and heavy metal enriched water is likely historic leaching next to the existing San Juan pit. Until recent clean-up activities were instigated by PD, surface water runoff into the pit likely included acid leachate derived either from former leaching operations near the pit or from dissolution of residual products of previous leaching from the spent ore piles.

The water chemistry of the existing San Juan pit lake exceeds BLM benchmark levels for aluminum (21 mg/L), copper (1.1 mg/L), manganese (0.78 mg/L), and zinc (0.834 mg/L). It also exceeds AWQS for nickel (0.10 mg/L). The recent clean-up activities to divert runoff away from the pit into lined evaporation ponds are discussed in Section 2.1.2.1.1.

3.2.2.6.4 100-year Floodplains. One-hundred year floodplains are delineated by the Federal Emergency Management Agency (FEMA). Within the project area, 100-year floodplains are delineated for portions of Watson, Talley, Cottonwood, Peterson, Wilson, and Lone Star washes, as shown on Figure 3-12. Zone A floodplains are areas in which the base flood elevations and flood hazard factors have not been determined. FEMA has not determined base flood elevations or flood hazard factors for the reach of the Gila River south of the project area nor for the major drainages that traverse the project area (FEMA 1984).

3.2.2.6.5 Waters of the United States. Waters of the United States are defined in the Clean Water Act as "surface waters, including streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, and other ephemeral watercourses and wetlands" (COE 1993). Waters of the United States (waters) on the project area, both on private and public lands, are under the jurisdiction of the COE, and activities that result in impacts to waters must be permitted by the COE under Section 404 of the Clean Water Act (see "Decisions to be Made" section in Chapter 1, Section 1.4.1). The COE also has regulatory authority over jurisdictional wetlands. Within an approximately 16,625-acre study area that includes the area proposed for mining, 113.92 acres of waters and 0.03 acres of wetlands were delineated as jurisdictional (SWCA 1997e).

> **Ephemeral Washes.** One-hundred-fifty-nine (159) ephemeral washes occurring on the study area were investigated as possible waters of the United States. Of these, 100 washes, ranging from large, named drainages with multiple braided channels, such as Peterson Wash, to smaller, unnamed, single-channel tributaries, were delineated. No perennial streams or reaches occur on the study area. The total area of jurisdictional waters on the project area is 113.92 acres.

Jurisdictional Wetlands. To be a jurisdictional wetland, an area must meet three criteria: the presence of vegetation dominated by hydrophytic species, hydric soil conditions, and wetland hydrology. Four perennial springs and one seep occurring on the study area were investigated as possible jurisdictional wetlands: Bryce Spring, Hackberry Spring, Cottonwood Spring, Walnut Spring, and DP Seep. Portions of Bryce Spring and Cottonwood Spring met wetlands criteria and were delineated as jurisdictional wetlands. These two habitats are described below. The total area of jurisdictional wetlands on the project area is 1,178 square feet (0.03 acres).

In some cases, wetlands are disturbed by cattle grazing and stock watering use. In such situations, the lack of any given wetlands criteria must be evaluated in light of these circumstances.

- **Bryce Spring Wetland.** The head of Bryce Spring is located on State of Arizona lands (see Figure 3-1) and lies within a small drainage at the northern end of the study area. Several small, shallow, bedrock pools are located about 0.75 mile downstream of the spring on PD property. These pools are inundated, have shallow soils exhibiting hydric conditions, and are vegetated with emergent species such as water speedwell (*Veronica anagallis-aquatica*), monkey-flower (*Mimulus guttatus*), pondweed (*Zannichellia palustris*), rabbitfoot grass (*Polypogon monspeliensis*), and deergrass *(Muhlenbergia rigens*). The total jurisdictional area of these pools is estimated to be 1,078 square feet. Use of this area by cattle is evident by the close cropping of deergrass and rabbitfoot grass in accessible areas.

- **Cottonwood Spring Wetland.** The jurisdictional wetland at Cottonwood Spring consists of a small, shallow, apparently human-made pool (approximately 100 square feet and 8-12 inches deep) fed by a broken spring box on a small ridge above Cottonwood Wash. Water from the spring box flows in a small trickle into the pool, which contains emergent vegetation such as water speedwell *(Veronica anagallis-aquatica*) and cattail (*Typha* sp.). Adjacent to the pool are a single medium-sized cottonwood tree (*Populus fremontii*), a Goodding willow tree (*Salix gooddingii*), and several small seep-willows (*Baccharis salicifolia*); a small thicket of cottonwood saplings grows nearby. Cottonwood Spring is located entirely on PD property. The total jurisdictional area of this pool is estimated to be 100 square feet. Cattle graze and trample the area when they come to water.

3.2.3 Biological Resources

3.2.3.1 Vegetation

Four major upland plant communities and two riparian plant communities were identified in the project area (SWCA 1997a). All are common and widespread in the Southwest. The plant community classification used here follows Brown, Lowe, and Pase (1979).

3.2.3.1.1 Upland Plant Communities. The upland plant communities identified in the project area are 1) Sonoran Desertscrub, 2) Semidesert Grassland, 3) Sonoran Desertscrub/Semidesert Grassland ecotone, and 4) Disturbed Land. With the exception of disturbed land, each of these communities in the project area succeeds the next in a progression from the southwest to the northeast, following general changes in elevation, topography, and soil (Figure 3-13). Generally, each community grades gradually into the next, making depicted limits necessarily somewhat arbitrary. Similarly, species dominance and plant densities vary with local topography and exposure. Each community is described below.

Sonoran Desertscrub. This biome occurs on the bajada (gently sloping alluvial fans) at lower elevations in the southern reaches of the project area and on some of the south-facing slopes along

the lower foothills of the Gila Mountains. It covers approximately 25,278 acres (49 percent) of the 51,930-acre study area that encompasses the project area (SWCA 1997a). In the study area, particularly on the bajada, this community is heavily dominated by creosotebush (*Larrea tridentata*). Although creosotebush also is dominant on foothill slopes, it is less abundant there and plants are more widely spaced than on the bajada. Other species commonly observed in this biome include ocotillo (*Fouquieria splendens*), blue paloverde (*Cercidium floridum*), mesquite (*Prosopis juliflora*), prickly pear (*Opuntia phaeacantha* and *O. chlorotica*), snakeweed (*Gutierrezia sarothrae*), catclaw acacia (*Acacia greggii*), banana yucca (*Yucca baccata*), barrel cactus (*Ferocactus wislizenii*), and devil's club cholla (*Opuntia stanlyi*). A few areas on the bajada show evidence of past disturbance, possibly from former cattle or mining operations. Mesquite, blue paloverde, and snakeweed are dominant in these areas.

Semidesert Grassland. This open plant community, dominated by snakeweed and grasses with generally widely scattered shrubs and trees, occurs in the northwestern corner of the study area where elevations are highest and the terrain steepest and rockiest. It occupies approximately 9,958 acres (19 percent) of the 51,930-acre study area. Grasses include tobosa (*Hilaria mutica*), sand dropseed (*Sporobolus cryptandrus*), needle grama (*Bouteloua aristidoides*), sideoats grama (*Bouteloua curtipendula*), black grama (*Bouteloua eriopoda*), sixweeks grama (*Bouteloua barbata*), sixweeks threeawn (*Aristida adscensionis*), spidergrass (*Aristida ternipes*), tanglehead (*Heteropogon contortus*), bush muhly (*Muhlenbergia porteri*), and green sprangletop (*Leptochloa dubia*). Shrubs and small trees include mesquite, Coahuila juniper (*Juniperus coahuilensis*), catclaw acacia, whitethorn acacia (*Acacia constricta*), scrub live oak (*Quercus turbinella*), banana yucca, soaptree yucca (*Yucca elata*), sotol (*Dasylirion wheeleri*), beargrass (*Nolina microcarpa*), ocotillo, and prickly pear. On north facing-slopes and along some drainages at higher elevations on the northwestern part of the study area, a number of species typical of Interior Chaparral and Pinyon-Juniper Woodland, such as pinyon pine (*Pinus* sp.), juniper, canotia (*Canotia holocantha*), and scrub oak, are present. At a finer scale, some of these areas might be mapped as interior chaparral or Great Basin Conifer Woodland, but none of the areas is more than a few acres in size and many plants typical of Semidesert Grassland are present as well. Large areas of Great Basin Conifer Woodland are present just north of the study area.

Sonoran Desertscrub/Semidesert Grassland Ecotone. Because of the gradual, relatively gentle change in elevation over much of the study area from the southwest to the northeast, the transition between creosotebush-dominated Sonoran Desertscrub and grass- or shrub-dominated Semidesert Grassland occurs over a relatively large area. Though this transition area could have been divided and the two parts grouped into either Sonoran Desertscrub and Semidesert Grassland, mapping the transition area as a separate community is more accurate. As one would expect, this area supports a mixture of species found in Sonoran Desertscrub and Semidesert Grassland. The only species of plant that appears to be more common in the transition area than in either the Sonoran Desertscrub or Semidesert Grassland is jojoba (*Simmondsia chinensis*), which occurs in dense patches on some north- and west-facing hillsides in the foothills of the Gila Mountains. Though the transition occurs gradually in many areas, relatively abrupt changes in vegetation occur in some places due to abrupt changes in elevation, exposure, and perhaps soil types. Sonoran Desertscrub/Semidesert Grassland Ecotone occupies approximately 16,157 acres (31 percent) of the 51,930-acre study area.

Disturbed Land. Four sites formerly used for mining purposes are located within the study area (Figure 3-13). These sites include large bladed areas, development rock, buildings, and abandoned mine equipment. They are largely unvegetated except for scattered Russian thistle (*Salsola iberica*) and other weedy species. Disturbed Land occupies approximately 521 acres (1 percent) of the 51,930-acre study area.

3.2.3.1.2 Riparian Plant Communities. Riparian plant communities identified in the study area include 1) Xeroriparian Mixed Scrub, associated with an ephemeral water supply, and 2) riparian vegetation, associated with perennial springs (SWCA 1997a). Xeroriparian habitats typically include plant species also found in adjacent uplands, but plants in xeroriparian habitats are typically larger and often occur in higher densities than those in adjacent uplands.

- **Xeroriparian Mixed Scrub.** This is the dominant riparian habitat type in the study area. Vegetation in Xeroriparian Mixed Scrub is similar to that found in adjacent uplands; therefore, Xeroriparian Mixed Scrub habitats are not depicted in Figure 3-13. The majority of Xeroriparian Mixed Scrub habitats in the study area are dominated by mesquite, catclaw acacia, whitethorn acacia, blue paloverde, and desert broom (*Baccharis sarothroides*). Seep-willow is locally common, and foothill washes occasionally contain desert hackberry (*Celtis spinosa*). Vegetation typically consists of well-spaced small trees along channel margins, with desert broom and seep-willow (*Baccharis salicifolia*) occasionally occurring as small isolated shrubs within channel margins. Two drainages in the northeastern-most portion of the study area, Bear Spring Canyon and Spring Canyon (see Figure 3-1), are dominated by scrub live oak. Codominants in these two drainages include Coahuila juniper, whitethorn acacia, and mesquite along channel margins, with scattered snakeweed and desert broom within channel margins.

- **Riparian Vegetation Associated with Perennial Springs and a Seep.** A variety of riparian vegetation types occur in association with four perennial springs and one seep in the study area: Bryce Spring, Hackberry Spring, Cottonwood Spring, Walnut Spring, and DP Seep (Figure 3-13). Bryce, Hackberry, Cottonwood, and Walnut Springs are naturally occurring, while DP Seep appears to be the result of past human activity. Because areas occupied by riparian vegetation in the vicinity of these springs are so small, specific classification of plant communities was not warranted.

- **Bryce Spring.** This is a natural spring located in T5S, R26E, Section 20 on State Lands with flow entering onto PDSI private lands. A series of pools occurring downstream in the drainage below the spring contain a variety of aquatic plants, including water speedwell (*Veronica anagallis-aquatica*), monkey-flower (*Mimulus guttatus*), pondweed (*Zannichellia palustris*), and rabbitfoot grass (*Polypogon monspeliensis*). These pools are located on PD private lands. Along the lower reaches of the drainage, common plants include rabbitfoot grass, seep-willow, deergrass (*Muhlenbergia rigens*), and Goodding willow (*Salix gooddingii*). Less common species include blue paloverde, catclaw acacia, and whitethorn acacia. Use of this area by cattle is evident by the close cropping of deergrass and rabbitfoot grass in accessible areas.

- **Hackberry Spring.** This is a natural spring located in T5S, R26E, Section 27 on PDSI Land. The spring is located in a drainage, and water from the spring is piped into a metal tank for use by cattle. The drainage contains Bermuda grass (*Cynodon dactylon*), mesquite, netleaf hackberry (*Celtis reticulata*), and seep-willow, but no emergent vegetation. Seep-willow is relatively dense for approximately 200 yards below the spring.

- **Cottonwood Spring.** This is a natural spring located in T5S, R26E, Section 27 on PDSI. The spring originates on a hill where water fills a small shallow pool. A metal pipe carries water from the pool to a cement trough, located about 50-60 feet from the pool. The pool contains green algae and emergent wetland vegetation, including water speedwell and cattail (*Typha latifolia*) that have been grazed by cattle. A few cottonwood (*Populus fremontii*) saplings are present around the spring. In the drainage (Cottonwood Wash) adjacent to the spring is a stand of cottonwood trees, the largest of which is approximately 35 feet in height and has a diameter at breast height (dbh) of approximately two feet. Other species present in the drainage are netleaf hackberry, mesquite,

seep-willow, and desert broom. Small cottonwood trees are present for approximately 75 yards down Cottonwood Wash from the spring.

- **Walnut Spring.** This is a natural seep located in a drainage in T5S, R26E, Section 26 on BLM-administered land. Shallow subsurface and surface water results in an approximately 70- foot stretch of the wash where vegetation differs from upstream and downstream portions and adjacent uplands. Shallow and exposed bedrock in the drainage bottom causes water to rise to the surface and flow as a slow trickle for approximately 275 feet before returning underground. Vegetation where surface water occurs and approximately 120 feet upstream of this area is dominated by Goodding willow and desert broom. Fremont cottonwood, mesquite, and seep-willow also occur in this stretch. Seep-willow and desert broom dominate for approximately 250 feet upstream of where the surface water begins.

- **DP Seep.** This feature, which is thought to be an artifact of past mining activity, is located in T5S, R26E, Section 27 on PD private land. Water seepage supports a hillside patch of seep-willow and Goodding willow ranging in height from 15 to 35 feet. A few small mesquites grow in the drainage directly below the seep. For the most part, however, the drainage bottom is devoid of vegetation, apparently as a result of cattle use. Wet conditions persist for approximately 100 feet down the drainage from the vicinity of the seep. Vegetation in this stretch is sparse, consisting primarily of seep-willow, desert tobacco (*Nicotiana trigonophylla*), and one large Goodding willow. Downstream of this area there are several large stands of dead seep-willow. The seep is situated directly downstream from inactive disposal areas and underground mine workings. The seep and vegetated area likely originated as a result of past mining activity directly up slope, and the source of water for this spring may be the overburden disposal area. It appears likely that water collects in this area and is discharged into surrounding geologic features before resurfacing at the DP Seep. The relatively young age of the willow trees at the seep, and the presence of dead mesquite trees within the Goodding willow/seep-willow patch on the slope suggest a relatively recent origin for DP Seep.

3.2.3.2 Wildlife

Fourteen mammal species, thirty bird species, and eight reptile species within or near the project area observed incidentally during field work by SWCA (1997a) are listed in Table 3-7. These species are typical of Sonoran Desertscrub and Semidesert Grassland habitats in southeastern Arizona.

3.2.3.2.1 Game Species. Principal big game species known to inhabit the project area include mule deer (*Odocoileus hemionus*) and collared peccary (*Tayassu tajacu*). Mule deer and collared peccary densities in the vicinity of the project area are considered medium (4 to 7 per square mile and 1.5 to 3 per square mile, respectively) by the Arizona Game and Fish Department (AGFD). These density estimates are based on a combination of off-site wildlife survey data and estimated habitat capabilities rather than on site-specific population surveys. Mountain lions (*Felis concolor*) also are expected to occur. Gambel's quail (*Callipepla gambelii*) is the most abundant game bird, reaching relatively high densities within the project area according to the Arizona Game and Fish Department (AGFD). Wildlife densities in Xeroriparian Mixed Scrub habitats within the project area are expected to be similar to those in surrounding uplands.[16] However, short stretches

[16] Because it is impractical to measure all wildlife, or even all vertebrate species, associated with a given habitat type, indirect measures of wildlife value utilizing habitat parameters are typically used to quantify or estimate habitat value. Vegetation volume is one such parameter. In the arid Southwest higher volumes of vegetation are typically associated with increases in available moisture and thus normally would correlate strongly with productivity. Strong correlations have been established between breeding-bird density and vegetation volume (Mills et al. 1991). During visits to the project area, bird species composition and densities in xeroriparian habitats were observed to be similar to those in surrounding upland habitats, and no bird species typically restricted to riparian habitats in Arizona were observed.

of relatively dense vegetation around springs probably support higher wildlife densities than surrounding uplands.

3.2.3.2.2 Non-Game Species. Non-game wildlife species observed in the project area are expected to be typical of the habitats present. No attempt was made to document all species occurring on the project area, but species observed incidental to fieldwork include those listed in Table 3-17.

3.2.3.3 Special Interest Species

Special interest species include those species that are listed or being considered for listing as threatened or endangered by the USFWS (federal endangered, threatened, proposed, or candidate species); or that are given sensitive species status by the BLM; or that are considered Wildlife of Special Concern in Arizona (WSCA) by the AGFD. Federally listed and proposed species and their designated critical habitat receive protection under the Endangered Species Act of 1973, as amended (ESA). The BLM sensitive species category as reported in this document includes all federally protected and candidate species, plus species formerly included on the USFWS Category 2 candidate species list (now discontinued, USFWS 1996). BLM sensitive species status does not confer legal protection on a species; however, it does identify species that may need special management consideration. Designation as a WSCA species protects a species in the State of Arizona against take as authorized under Arizona statute ARS Title 17-309.

Forty special interest species have been identified by the above-mentioned agencies as potentially occurring in the project area (Table 3-18). The likelihood of that occurrence has been evaluated by means of a records search, habitat evaluation, and, where appropriate, field surveys (SWCA 1994, 1996, 1997a, 1997d, 1997f). Results of the evaluations are summarized in the special interest species accounts following Table 3-18. These accounts incorporate status changes published in the most recent editions of Animal Candidate Review (Federal Register 59:58982-59028, 15 Nov. 1994 and Federal Register 60:10694-10715, 27 Feb. 1995).

No federally listed, proposed, or candidate species are known to occur in the project area, and none was observed there during field surveys. However, one undetermined hedgehog cactus, morphologically similar to the endangered Arizona hedgehog cactus was recorded on PD land. Two listed species, the endangered peregrine falcon and the threatened bald eagle, may occasionally fly over the area while foraging and/or migrating. No habitat suitable for federally listed species, other than Arizona hedgehog cactus, is present in the project area, but suitable habitat for the southwestern willow flycatcher, bald eagle, and cactus ferruginous pygmy-owl exists along the Gila River downslope of the project area to the south and southwest. Southwestern willow flycatchers are known to nest along this reach of the Gila River. The same reach is also designated critical habitat for the endangered razorback sucker, although the species no longer occurs there. One additional endangered species, Gila topminnow, is present in Watson Wash downslope of the project area to the southwest. An endangered least tern (*Sterna antillarum*) was observed by SWCA biologists south of the project area along the Gila River on April 18, 1997 (G.S. Mills, SWCA, pers. comm.). However, least tern is considered an accidental visitor to southeastern Arizona; therefore, the Project is extremely unlikely to affect the species and it is not considered further (ibid.).

Table 3-17. Wildlife Species Observed in the Project Area

Mammals		
	Yuma antelope ground squirrel	*Ammospermophilus harrisii*
	Rock squirrel	*Spermophilus variegatus*
	Merriam kangaroo rat	*Dipodomys merriami*
	Cactus mouse	*Peromyscus eremicus*
	White-throated woodrat	*Neotoma albigula*
	Ringtail	*Bassaricus astutus*
	Coati	*Nasua nasua*
	Townsend's big-eared bat	*Plecotus townsendii pallescens*
	California leaf-nosed bat	*Macrotus californicus*
	Cave myotis	*Myotis velifer*
Birds		
	red-tailed hawk	*Buteo jamaicensis*
	golden eagle	*Aquila chrysaetos*
	common barn-owl	*Tyto alba*
	great horned owl	*Bubo virginianus*
	Greater roadrunner	*Geococcyx californianus*
	Lesser nighthawk	*Chordeiles acutipennis*
	Ladder-backed woodpecker	*Picoides scalaris*
	Western kingbird	*Tyrannus verticalis*
	Say's phoebe	*Sayornis saya*
	Common raven	*Corvus corax*
	Verdin	*Auriparus flaviceps*
	Canyon wren	*Catherpes mexicanus*
	Rock wren	*Salpinctes obsoletus*
	Cactus wren	*Campylorhynchus brunneicapillus*
	Black-tailed gnatcatcher	*Polioptila melanura*
	Loggerhead shrike	*Lanius ludovicianus*
	Northern mockingbird	*Mimus polyglottos*
	Curve-billed thrasher	*Toxostoma curvirostre*
	Crissal thrasher	*Toxostoma crissale*
	Canyon towhee	*Pipilo fuscus*
	Black-throated sparrow	*Amphispiza bilineata*
	Brown-headed cowbird	*Molothrus ater*
	House finch	*Carpodacus mexicanus*
Reptiles		
	Greater earless lizard	*Cophosaurus texanus*
	Round-tailed horned lizard	*Phrynosoma modestum*
	Common collared lizard	*Crotaphytus collaris*
	Side-blotched lizard	*Uta stansburiana*
	Desert spiny lizard	*Sceloporus magister*
	Western whiptail	*Cnemidophorus tigris*
	Western diamondback rattlesnake	*Crotalus atrox*

Source: SWCA 1997a Observations were incidental to fieldwork.

Table 3-18. Special Interest Species Potentially Occurring in the Dos Pobres/San Juan Project Vicinity

Species' Common Name	Scientific Name	Status*
Plants with Status under the ESA		
Arizona hedgehog cactus	*Echinocereus triglochidiatus arizonicus*	E, SS, HS
Arizona cliff rose	*Purshia subintegra*	E, SS, HS
Animals with Status under the ESA		
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	E, SS, WSCA
Razorback sucker	*Xyrauchen texanus*	E, SS, WSCA
Desert pupfish	*Cyprinodon macularius*	E, SS, WSCA
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	E, SS, WSCA
Southwestern willow flycatcher	*Empidonax traillii extimus*	E, SS, WSCA
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	E, SS, WSCA
Mount Graham red squirrel	*Tamiasciurus hudsonicus grahamensis*	E, SS, WSCA
Loach minnow	*Tiaroga cobitis*	T, SS, WSCA
Spikedace	*Meda fulgida*	T, SS, WSCA
Apache (Arizona) trout	*Oncorhynchus apache*	T, SS, WSCA
Bald eagle	*Haliaeetus leucocephalus*	T, SS, WSCA
Mexican spotted owl	*Strix occidentalis lucida*	T, SS, WSCA
Wet Canyon talussnail	*Sonorella macrophallus*	C, SS, WSCA
Chiricahua leopard frog	*Rana chiricahuensis*	C, SS, WSCA
Gila chub	*Gila intermedia*	C, SS, WSCA
Other Species of Special Interest		
Roundtail chub	*Gila robusta*	SS, WSCA
Lowland leopard frog	*Rana yavapaiensis*	SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Northern Goshawk	*Accipiter gentilis*	SS, WSCA
Ferruginous Hawk	*Buteo regalis*	SS, WSCA
Yellow-billed cuckoo	*Coccyzus americanus*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Greater western mastiff bat	*Eumops perotis*	SS, WSCA
Pima Indian-mallow	*Abutilon parishii*	SS
Longfin dace	*Agosia chrysogaster*	SS
Speckled dace	*Rhinicthys osculus*	SS
Sonoran sucker	*Catostomus insignis*	SS
Desert sucker	*Catostomus clarki*	SS
Texas horned lizard	*Phrynosoma cornutum*	SS
Gila monster	*Heloderma suspectum*	SS
Common black-hawk	*Buteogallus anthracinus*	SS
Western burrowing owl	*Athene cunicularia hypugea*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Long-legged myotis	*Myotis volans*	SS
Fringed myotis	*Myotis thysanodes*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

* Status Key: E = Federal Endangered; T = Federal Threatened; C = Federal Candidate; SS = BLM Sensitive Species; WSCA = Wildlife of Special Concern in Arizona (AGFD 1986); HS = Highly safeguarded under Arizona Native Plant Law.

One BLM sensitive plant species (Pima Indian-mallow) and four sensitive animal species (Gila monster, Townsend's big-eared bat, California leaf-nosed bat, and cave myotis) are known to occur in the project area. The Townsend's big-eared bat is also listed as WSCA by the AGFD. Eleven other BLM sensitive species (northern goshawk, ferruginous hawk, common black-hawk, yellow-billed cuckoo, burrowing owl, small-footed myotis, long-legged myotis, fringed myotis, Yuma myotis, Allen's big-eared bat, and greater western mastiff bat) may occasionally visit. Of these, northern goshawk, ferruginous hawk, yellow-billed cuckoo, and greater western mastiff bat are also listed as WSCA by the AGFD. A life history account and habitat suitability evaluation are provided below for each of the 42 special interest species addressed in this EIS (SWCA 1997a).

3.2.3.3.1 Threatened and Endangered Plants.

- **Hedgehog Cactus.** Hedgehog cacti (*Echinocereus* sp.) morphologically similar to Arizona hedgehog cactus (*Echinocereus triglochidiatus arizonicus*), a species listed as endangered in 1979 by the USFWS, were found within the northernmost portion of the project area (SWCA 1997a). Arizona hedgehog cactus is listed by the USFWS as occurring in Maricopa, Gila, and Pinal Counties (USFWS 1992). Habitat for Arizona hedgehog is described as open slopes, in narrow cracks between boulders, and in the understory of shrubs in the ecotone between Madrean Evergreen Woodland and interior chaparral (USFWS 1992). In addition to the plants found within the project area, SWCA field personnel have located populations of morphologically similar plants at approximately seven other locations between the Morenci area and the type locality near Globe/Miami (SWCA 1995b).

  The taxonomy of cacti in general and *Echinocereus* cacti in particular is complex and poorly understood. Benson (1982) provided a taxonomic treatment of *Echinocereus* in which he recognized six varieties of *E. triglochidiatus* occurring in Arizona. Although he provided no key to the varieties of *E. triglochidiatus*, he did present a table of "distinctive characters." Many of the "distinctive characters" listed by Benson vary widely, and the range of any single character in one variety frequently overlaps the range of the character in one or more other varieties. Overlaps in characters of some varieties, such as *arizonicus* and *neomexicanus*, are so extensive as to render individual plants from an unknown location unidentifiable. This situation is further complicated by more recent data which indicate that some of the "distinctive characters" listed from the type locality of *arizonicus* are in error. Because of uncertainties regarding the taxonomy and distribution of *arizonicus*, the identity of the *Echinocereus* cacti within the project area is unclear, as is the status of this plant under the Endangered Species Act.

  As a result of field sampling areas considered to be potentially suitable habitat, 106 undetermined *Echinocereus* plants were found on five of the six areas surveyed. They grew mostly on steep, rocky hillsides and cliffs, as expected. Extrapolating the density of plants found on these surveys (1 plant per 1.2 acres) to the liberally estimated 3,750 acres of potentially suitable habitat in the project area (Figure 3-14) results in an estimate of approximately 3,100 plants within the northern portions of the project area. Of this total, an estimated 1,600 individual plants may occur on an estimated 1,950 acres of BLM lands, and an estimated 1,500 individual plants may occur on an estimated 1,800 acres of PD lands.

- **Arizona Cliff Rose.** Arizona cliff rose (*Purshia subintegra*) is listed as endangered by the USFWS. This variable species grows only on Tertiary limestone lakebed deposits just below the Mogollon Rim in central Arizona. The nearest known location to the project area is on the San Carlos Apache Reservation in northern Graham County. No suitable habitat for this plant exists in the project area.

3.2.3.3.2 Threatened and Endangered Animals. The following evaluations indicate the federal status as determined by the USFWS of each species potentially occurring in the project area, and states whether the AGFD has designated that species a Wildlife [species] of Special Concern in Arizona (WSCA). The designation WSCA, which identifies species whose occurrence in the State of Arizona is judged to be in jeopardy or potentially in jeopardy, is primarily intended to guide management decisions. In the following list, species are arranged by their federal status: endangered first, followed by proposed endangered, then threatened and candidate.

- **Gila Topminnow** (*Poeciliopsis occidentalis occidentalis*) is listed as endangered by the USFWS and as WSCA by the AGFD. Once abundant and widely distributed in low- and mid-elevation streams throughout the Gila River system, this small fish is now found only at isolated locations where it has persisted or been reintroduced. Because of the lack of any significant water, it does not occur in the project area. However, a small, introduced population of this species is present less than a mile from the edge of the project area in water from a hot artesian well in Watson Wash near its confluence with the Gila River.

- **Razorback Sucker** (*Xyrauchen texanus*) is listed as endangered by the USFWS and as WSCA by the AGFD. Razorback sucker formerly occupied all the larger streams in the Gila River Basin including the mainstream Gila River and possibly Eagle Creek. Razorback sucker is believed to have been extirpated from the Gila River early in this century. Despite reintroductions into the Gila River and Eagle Creek between 1981 and 1989 (Hendrickson 1993), it appears doubtful that this species is currently present. An aquatic survey of the Gila River through the Safford Valley in May 1997, conducted using electroshocking and seining techniques, produced no razorback suckers or any other special status fish species (SWCA 1997d). Nonetheless, designated critical habitat for the razorback sucker in Arizona includes the Gila River from the Arizona-New Mexico border to Coolidge Dam, including the Gila River just south of the project area (USFWS 1993). No suitable habitat for razorback sucker or any other fish occurs in the project area.

- **Desert Pupfish** (*Cyprinodon macularius*) is listed as endangered by the USFWS and as WSCA by the AGFD. This small fish was formerly widespread throughout the Gila River basin but was extirpated from most of its range. According to the USFWS (1991), no natural populations of desert pupfish remain in Arizona, but the species has been reintroduced at several locations. No suitable habitat for pupfish or any other fish occurs in the project area. Three reintroduction sites, Big Springs, Cold Springs, and Howard Well, are located in Graham County. Pupfish have died out at two locations, but are still present at Cold Springs (D. Duncan, USFWS, pers. comm. 1996; B. Robles, BLM, pers. comm. 1997).

- **American Peregrine Falcon** (*Falco peregrinus anatum*) is listed as endangered by the USFWS but does not have WSCA status. Probably the most important breeding habitat requirement of this species is the presence of tall cliffs (typically over 150 feet but sometimes as low as 60 feet), which serve both as nesting and perching sites. In Arizona, breeding activity was documented at 206 locations in 1995. As a result of this large and expanding breeding population, the USFWS and the Western Peregrine Falcon Recovery team are developing a draft addendum to the peregrine recovery plan in which the southwestern populations would be downlisted or delisted. Known peregrine nest sites are located more than 15 miles southwest and 15 miles north/northeast of the project area in the Pinaleño Mountains and along Eagle Creek, respectively (L. Ward, AGFD, pers. comm. 1994).

Cliffs and rock outcrops within the project area are not suitable for nesting by peregrine falcons, and there are no known nest sites within 10 miles. Despite the absence of nearby nest records, it is possible that peregrine falcons occasionally visit the project area to forage. If so, they are not expected to occur regularly.

- **Cactus Ferruginous Pygmy-owl** (*Glaucidium brasilianum cactorum*) is listed as endangered by the USFWS and as WSCA by the AGFD. The cactus ferruginous pygmy-owl's primary habitats in central and southern Arizona are riparian cottonwood forests and mesquite bosques. This species is also known to occur in Sonoran Desertscrub associations of paloverde (*Cercidium* sp.), bursage (*Ambrosia* sp.), ironwood (*Olnea tesota)*, mesquite, acacia (*Acacia* sp.), and giant cacti such as saguaro (*Cereus gigianteus*) and organpipe (*Cereus thurberi*). The cactus ferruginous pygmy-owl has been reported historically from along the Gila River near its confluences with Bonita Creek and with Eagle Creek, approximately 10 miles and 15 miles east of the project area, respectively, and it likely occurred historically along the Gila River just south of the project area as well. However, the species has not been recorded anywhere near the project area in recent times. No suitable habitat for cactus ferruginous pygmy-owl is present in the project area. Though some patches of riparian forest along the Gila River and lower Eagle and Bonita Creeks may be extensive enough to provide suitable habitat for this species, no extensive mesquite bosques or apparently suitable upland habitat is present in the project area. Despite the absence of recent records, lower Bonita Creek and a portion of the Gila River upstream from the project area were included in proposed critical habitat for this species (Federal Register December 12, 1994 p. 63975-63986). No critical habitat was designated at the time of the final rule for listing (Federal Register March 10, 1997 p. 10730-10747). Surveys for this species along portions of the Gila River from Pima Bridge to areas upstream of the Solomon Bridge have not documented this species.

- **Southwestern Willow Flycatcher** (*Empidonax traillii extimus*) is listed as endangered by the USFWS and as WSCA by the AGFD. This small flycatcher is present in Arizona only during the nesting season. Nesting habitat is usually dominated by dense stands of willow (*Salix* spp.), tamarisk (*Tamarix ramosissima*), button bush (*Cephalanthus occidentalis*), or Fremont cottonwood exhibiting very high total vegetation volume up to at least 13 feet, with or without an overstory. No riparian habitat suitable as nesting habitat for this species exists within the project area.

  Though it is extremely unlikely that southwestern willow flycatcher occurs regularly in the project area, the species is known to nest at several sites along the Gila River south of the project area. Three territorial male southwestern willow flycatchers and one nest were found along the Gila River south of the project area near the Solomon Bridge east of Safford in May 1995. In 1996, SWCA biologists surveyed potentially suitable habitat for southwestern willow flycatcher along the Gila River from the Solomon Bridge downstream to the confluence with Watson Wash, a stream distance of approximately 10 miles. They located willow flycatchers in two additional areas (SWCA 1996b). In the first location (Patch #3), approximately one mile west of the Solomon Bridge, they detected two to three singing willow flycatchers on each of three visits (June 12, 20, and 26). According to Troy Corman of the AGFD, this same area was monitored in 1996 by biologists from the National Biological Survey, who located four pairs of flycatchers. At the second location (Patch #11), approximately one mile northeast of Thatcher, SWCA biologists detected two southwestern willow flycatchers and found a nest (ibid.).

  In a survey conducted in May-July 1997, from the Solomon Bridge to just west of the Pima Bridge, biologists were unable to resurvey Patch #3 because the landowner withheld permission, and they detected no flycatchers in Patch #11 (SWCA 1997f). However, southwestern willow flycatchers were found at three additional locations. In a riparian patch on the south side of the Gila River about 0.75 mile west of the Watson Wash confluence, approximately 18-20 flycatchers were heard singing on

May 29-30, June 19, and July 1. Just across the river, in Patch #20, biologists detected one flycatcher on May 29; 6-10 flycatchers on June 19; and one nest on July 1. Farther downstream, about 0.25 mile east of Pima Bridge (Patch #29), biologists detected two flycatchers on May 28; 6-8 flycatchers on June 19; and three on July 1 (SWCA 1997f).

- **Lesser Long-nosed Bat** (*Leptonycteris curasoae yerbabuenae*) is listed as endangered by the USFWS and as WSCA by the AGFD. This migratory bat feeds mainly on nectar and pollen from columnar cacti and agaves. Roosts and maternity colonies are typically found in abandoned mine tunnels. The project area is just north of the known range of this species; the nearest recorded location is in the Pinaleño Mountains, more than 15 miles southwest of the project area. No evidence of this species was found in any of the mine features visited in the project area (Figure 3-14), and densities of saguaros and agaves in the project area are extremely low. It is highly unlikely that this species occurs regularly in the project area.

- **Mount Graham Red Squirrel** (*Tamiasciurus hudsonicus grahamensis*) is listed as endangered by the USFWS and as WSCA by the AGFD. This squirrel occurs only in mixed conifer and spruce-fir forests at higher elevations in the Pinaleño Mountains more than 15 miles southwest of the project area. No suitable habitat for this species exists in the project area.

- **Loach Minnow** (*Tiaroga cobitis*) is listed as threatened by the USFWS and as WSCA by the AGFD. Loach minnow is essentially restricted to gravelly riffles either in main channels of shallow, swift reaches or along margins of larger rapids. No suitable habitat for loach minnow or any other fish occurs in the project area. The nearest location where this species is known to occur is upper Eagle Creek, more than 30 miles northeast of the project area.

- **Spikedace** (*Meda fulgida*) is listed as threatened by the USFWS and as WSCA by the AGFD. Spikedace prefer areas of moving water less than a meter deep most of the year. They are typically found near the downstream end of riffles or in eddies. No suitable habitat for spikedace or any other fish occurs in the project area. The nearest known location where this species is known to occur is Eagle Creek, more than 15 miles east/northeast of the project area.

- **Apache (Arizona) Trout** (*Oncorhynchus apache*) is listed as threatened by the USFWS and as WSCA by the AGFD. A native trout, probably Apache but possibly Gila, is known to have historically occurred in upper Eagle Creek, more than 30 miles from the project area. This species appears to have been completely supplanted by introduced rainbow trout (Minckley 1973). The native species was not known to occur below about 5,000 feet elevation. No suitable habitat for Apache trout or any other fish occurs in the project area.

- **Bald Eagle** (*Haliaeetus leucocephalus*) is listed as threatened by the USFWS and as WSCA by the AGFD. Only a few bald eagles nest in Arizona, primarily along the Salt, Verde, and Bill Williams Rivers, but an estimated 200 to 300 birds do winter in the state. Though most wintering birds are found near water or in grasslands in the White Mountains and along the Mogollon Rim, a few winter in southeastern Arizona. No suitable breeding or wintering habitat is present in the project area, but bald eagles may occur occasionally as visitors during migration or in winter. A small number of eagles may winter irregularly along the Gila River, Bonita Creek, and Eagle Creek.

- **Mexican Spotted Owl** (*Strix occidentalis lucida*) is listed as threatened by the USFWS and as WSCA by the AGFD. The Mexican spotted owl generally breeds in dense oak or coniferous forests. No suitable breeding habitat for this species is present in the project area. The closest suitable habitat is several miles to the north. Some spotted owls move to lower elevations in winter, and it is possible that this species very rarely visits in the project area during seasonal movements.

- **Wet Canyon Talussnail** (*Sonorella macrophallus*) is listed as a candidate species by the USFWS and as WSCA by the AGFD. Candidates are currently defined by the USFWS to include only those species for which the Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act but has not done so (formerly Category 1 species). The wet canyon talussnail is known only from talus slopes at approximately 6,000 feet in heavily vegetated areas of Wet Canyon in the Pinaleño Mountains, more than 15 miles from the project area. No suitable habitat is present in the project area for this species.

- **Chiricahua Leopard Frog** (*Rana chiricahuensis*) is listed as a candidate species by the USFWS and as WSCA by the AGFD. This frog occurs locally at middle to higher elevations in central and southeastern Arizona, primarily along rocky streams. The identity of leopard frogs in Eagle Creek, east of the project area, is not clear. A single leopard frog labeled as this species and collected at 3,300 feet in Eagle Creek is present in the collections at Arizona State University (ASU # 16110), but Platz and Frost (1984) consider the leopard frogs in Eagle Creek to be a different but similar species: the lowland leopard frog (*Rana yavapaiensis*). Platz and Frost believe the two species are allopatric. No leopard frogs or tadpoles were observed by SWCA biologists at any of the springs in the project area. The few stock tanks in the area are ephemeral, and it appears highly unlikely that leopard frogs would be present in any of them.

- **Gila Chub** (*Gila intermedia*) is listed as a candidate species by the USFWS. This small native fish occupies perennial creeks, cienegas, and small impoundments in the Verde, middle Gila, Santa Cruz, and San Pedro River drainages in central and southern Arizona. Gila chub is known to occur in Bonita Creek, approximately 10 miles east of the project area (B. Robles, BLM, pers. comm. 1997), but no suitable habitat exists within the project area.

3.2.3.3.3 Critical Habitat. No proposed or designated critical habitat for any listed or proposed threatened or endangered species occurs on the project area. However, designated critical habitat for the razorback sucker (endangered) in Arizona includes the Gila River from the Arizona-New Mexico border to Coolidge Dam, including a reach of the river just south of the project area (Federal Register January 29, 1993 p. 6578-6597).

3.2.3.3.4 BLM Sensitive Species. Sensitive species are those species designated by the BLM State Director, in cooperation with a state agency responsible for managing the species, as sensitive. Such species may include 1) species under status review by the USFWS/National Marine Fisheries Service; 2) species whose numbers are declining so rapidly that federal listing may become necessary; 3) species with typically small and widely dispersed populations; or 4) species inhabiting ecological refugia or other specialized or unique habitats. The following sensitive species were evaluated because they are thought to have the potential to occur in the region that includes the project area. The list has been divided between BLM sensitive species that also have WSCA status with the state and those that do not.

- **BLM Sensitive Species also listed as WSCA**

  Roundtail Chub (*Gila robusta*) is designated BLM sensitive and listed as WSCA by the AGFD. Though it has undoubtedly declined from its historic distribution in Arizona, this species still occurs in many streams in central Arizona. The nearest location where this species is known to occur is Eagle creeks, about 15 miles east/northeast of the project area. No suitable habitat for roundtail chub or any other fish occurs in the project area.

Lowland Leopard Frog (*Rana yavapaiensis*) is designated BLM sensitive and listed as WSCA by the AGFD. This leopard frog occurs in south-central, central, west-central, and extreme northwestern Arizona, primarily below 3,000 feet elevation. The nearest locations to the project area where this species is known to occur are Bonita Creek and the Gila River. Leopard frogs in Eagle Creek were considered to be this species by Platz and Frost (1984), but a single leopard frog collected at 3,300 feet in Eagle Creek and present in the collections at Arizona State University (ASU # 16110), is labeled as Chiricahua leopard frog (see discussion above for Chiricahua leopard frog). No leopard frogs or tadpoles were observed at any of the springs in the project area. The few stock tanks in the area are ephemeral and it appears highly unlikely that leopard frogs would be present in any of them.

Mexican Garter Snake (*Thamnophis eques*) is designated BLM sensitive and listed as WSCA by the AGFD. This snake occurs primarily in permanent marshes and streams at middle elevations in central, south-central, and southeastern Arizona. No suitable habitat is present in the project area, but Mexican garter snake may be present along Bonita Creek, Eagle Creek, or portions of the Gila River.

Northern Goshawk (*Accipiter gentilis*) is designated BLM sensitive and listed as WSCA by the AGFD. This hawk nests in coniferous woodlands at higher elevations in northeastern Arizona and in mountains of southeastern Arizona. It occurs at lower elevations in some winters. No suitable habitat for nesting is present in the project area. The nearest suitable nesting habitat for this species is in the Pinaleño Mountains more than 15 miles southwest of the project area. Goshawk may occur on rare occasions in the area during winter.

Ferruginous Hawk (*Buteo regalis*) is designated BLM sensitive and listed as WSCA by the AGFD. In Arizona, it is considered an uncommon to rare and widely distributed summer resident of grasslands in the northern part of the state. It formerly occurred near Prescott and in the southeastern part of the state. Nest sites include trees and bushes, ledges, large rocks, riverbanks, and hillsides. In winter, this species is considered fairly common in open country, mainly irrigated and grassy areas, throughout southern Arizona.

Grassland habitats within the northernmost project area are patchily distributed and small in size, and do not appear typical of habitats used by ferruginous hawks. There are no irrigated agricultural lands within the project area, although irrigated farmlands are common just south of the project area near Safford. It is virtually certain that ferruginous hawk does not occur within the project area during the breeding season, but birds may occasionally visit the area in winter or during migration.

Yellow-billed Cuckoo (*Coccyzus americanus)* is designated BLM sensitive and listed as WSCA by the AGFD. In Arizona, this cuckoo nests primarily in well-developed riparian woodlands. No suitable habitat is present in the project area; riparian woodlands near springs are too small to be suitable. Suitable woodlands may be present along parts of the Gila River south of the project area and to the east along Bonita and Eagle Creeks. Yellow-billed cuckoos may occur on the project area occasionally during migration.

Townsend's Big-eared Bat (*Plecotus townsendii pallescens*) is designated BLM sensitive and listed as WSCA by the AGFD. In Arizona, this bat is widespread, although apparently not common anywhere within its range. Townsend's big-eared bat inhabits mine features and caves, but does not appear to use natural rock crevices. It is known to hibernate during the winter in cold caves, lava tubes, and mines mostly in uplands and mountains from the Grand Canyon to the southeastern part of the state. A single Townsend's big-eared bat was observed by SWCA biologists at a mine feature (site 20) on 27 January 1994 (Figure 3-14).

Greater Western Mastiff Bat (*Eumops perotis*) is designated BLM sensitive and listed as WSCA by the AGFD. This large bat is distributed in a wide belt from northwestern to southeastern Arizona. This bat typically roosts in crevices and shallow caves on the sides of cliff and rock walls. Because they apparently require a vertical drop of more than six feet to become airborne, this species is not found in most mine tunnels. No suitable roost sites are known to occur in the project area, but roosts sites are known from northeast of the project area, and it is likely that this species occasionally forages over the project area.

BLM Sensitive Species Not Listed as WSCA

Pima Indian-mallow (*Abutilon parishii*) is a BLM sensitive species but is not listed by the AGFD. This plant occurs in canyons among rocks, on rocky hillsides, and in canyon bottoms at elevations ranging from 3,000 to 4,700 feet (USFWS 1992). Known locations in Arizona include the Santa Catalina Mountains, Tucson Mountains, and Ragged Top in Pima County, and near Bagdad in Yavapai County (USFWS 1992). A population of about 10 plants was located on BLM lands in the project area on November 17, 1994 (Figure 3-14) (SWCA 1997a). It is possible that this species may occur elsewhere within the project area. However, habitats suitable in the vicinity for this species are probably limited to the foothills of the Gila Mountains.

Longfin Dace (*Agosia chrysogaster*) is a BLM sensitive species but is not listed by the AGFD. No suitable habitat for longfin dace or any other fish occurs in the project area. The nearest locations where this species is known to occur are Bonita and Eagle creeks, 10-15 miles east/northeast of the project area.

Speckled Dace (*Rhinicthys osculus*) is a BLM sensitive species but is not listed by the AGFD. No suitable habitat for speckled dace or any other fish occurs in the project area. The nearest locations where this species is known to occur are Bonita and Eagle Creeks, 10-15 miles east/northeast of the project area.

Sonora Sucker (*Catostomus insignis*) is a BLM sensitive species but is not listed by the AGFD. No suitable habitat for Sonora sucker or any other fish occurs in the project area. The nearest locations where this species is known to occur are Bonita and Eagle Creeks, 10-15 miles east/northeast of the project area.

Desert Sucker (*Catostomus* [= *Pantosteus*] *clarki*) is a BLM sensitive species but is not listed by the AGFD. No suitable habitat for desert sucker or any other fish occurs in the project area. The nearest locations where this species is known to occur are Bonita and Eagle Creeks, 10-15 miles east/northeast of the project area.

Texas Horned Lizard (*Phrynosoma cornutum*) is a BLM sensitive species but is not listed by the AGFD. This lizard is found in open arid or semiarid habitats with sparse vegetation. Its range extends into the extreme southeast corner of Arizona. It is not known to occur north of the Gila River and is highly unlikely to occur in the project area.

Gila Monster (*Heloderma suspectum*) is a BLM sensitive species but is not listed by the AGFD. The project area falls within the periphery of the Gila monster's range, which covers the southwestern half of Arizona (bisected diagonally). This species is found in Mohave Desertscrub, Sonoran Desertscrub, and desert grasslands, where it inhabits dens in highland rocky outcrops during the winter, and cooler, moister lower bajadas or valleys in the summer. The winter and summer abodes of an individual tend to be less than 0.62 mile apart (Lowe et al. 1986). In Arizona, Gila monsters have been recorded from elevations as low as 100 feet in the Colorado River Valley and as high as

5100 feet along the San Pedro Valley. They are known to occur in the project area (B. Robles, BLM, pers. comm. 1997).

Common Black-hawk (*Buteogallus anthracinus)* is a BLM sensitive species but is not listed by the AGFD. This hawk nests only along perennial streams with patches of well-developed riparian woodland. No suitable habitat is present within the project area. Black-hawks occur regularly along Bonita Creek and Eagle Creek. Though they are present farther upstream on the Gila River and its tributaries, lack of perennial water limits habitat suitability along the Gila River south of the project area. Black-hawks may occur on rare occasions in the project area during migration.

Western Burrowing Owl (*Athene cunicularia hypugea*) is a BLM sensitive species but is not listed by the AGFD. The western burrowing owl is an uncommon and rather local resident in Sonoran grasslands and fallow or abandoned farmlands, except in farm areas around Phoenix and Yuma where it is considered common. It apparently also breeds in desert, sagebrush, and pinyon-juniper habitats, and in disturbed areas such as road cuts and airport landing strips. It depends on rodent burrows for nesting sites. There is an old summer record (date unknown) of this species from Safford, about 10 miles south of the project area (Phillips et al. 1964) and the species nested approximately 0.75 mile north of the Safford airport in 1994 (B. Robles, BLM, pers. comm. 1997).

Though grassland habitat within the northernmost project area is similar to habitats known to be used by this species, soils in this area are relatively shallow and rocky and may be unsuitable for nesting sites due to a scarcity of burrowing rodents. Considering that burrowing owls have in the past been observed in the vicinity of Safford, it is possible that they occasionally may visit the project area, although they are not expected to occur regularly.

California Leaf-nosed Bat (*Macrotus californicus*) is a BLM sensitive species but is not listed by the AGFD. It is a year-round resident of desertscrub habitats of southern and western Arizona, California, and Nevada where it roosts colonially in mines and caves. Short-term roosts include tunnels less than 35 feet deep, but more typically roosts are deep within tunnels several hundred feet long. California leaf-nosed bats were observed within the project area at site 3 (at least eight); at site 5 (one); at site 13 (more than twelve); and at site 21 (at least six) (Figure 3-14). Approximately 300 California leaf-nosed bats historically have been observed in the Sanchez mine (less than 5 miles east of the project area), but this group was driven from the mine in 1994 when the BLM closed the mine feature (B. Robles, BLM, pers. comm. 1997). This species also has been recorded near Pima and Glenbar (Hoffmeister 1986), about 10 miles west of the project area.

Small-footed Myotis (*Myotis ciliolabrum*) is a BLM sensitive species but is not listed by the AGFD. This species is distributed throughout most of Arizona (with the exception of the southwestern corner) where it is found in oak, juniper, chaparral, and riparian vegetation types. Habitat requirements for roost selection are poorly known, but in summer the small-footed myotis has been found in rock crevices, buildings, caves, mine tunnels, and even in loose tree bark. Maternity colonies appear to be small, containing up to 20 females with young, and have been found in buildings and tree cavities. This species has been found wintering in Arizona south of the Gila River. It has been recorded in the Pinaleño Mountains (ibid.), more than 15 miles southwest of the project area.

Though most of the project area does not support vegetation typical of areas where this species has been found regularly, the project area is within the summer range of this species in Arizona as shown by Hoffmeister (1986). It is therefore possible that this species may utilize mine shafts, mine adits, and natural roost sites for roosting or breeding. None were observed during investigations of 22 mine features on the project area (Figure 3-14).

Long-legged Myotis (*Myotis volans*) is a BLM sensitive species but is not listed by the AGFD. In Arizona, this species is found in pinyon-juniper, oak, and coniferous forests throughout the northern, central, and southeastern portions of the state. It has been observed at elevations ranging from 4,000 to over 9,000 feet. Long-legged myotis form summer maternity colonies in buildings, rock crevices, cliffs, and trees. This species does not use caves for roosting during the day, but it has been observed using caves as roosts during the night. It has been recorded in the Pinaleño Mountains (Hoffmeister 1986), more than 15 miles southwest of the project area.

Oak woodland habitats and large stands of pinyon-juniper are not present within the project area, but the project area is within the summer range of this species in Arizona as shown by Hoffmeister (1986) and large areas of pinyon-juniper woodland are present north of the project area in the Gila Mountains. Although not expected to utilize habitats in the project area for roosting or breeding, it is possible that the long-legged myotis may occasionally visit the project area.

Fringed Myotis (*Myotis thysanodes*) is a BLM sensitive species but is not listed by the AGFD. In Arizona during summer, this species is widespread except for the southwestern part of the state. Within this range it seems to prefer oak woodland, from which it forages into nearby habitats such as low desert, chaparral, and ponderosa pine. In winter, the fringed myotis is found in the mountains of the northwest and southeast corners of the state. This species roosts in caves, mines, and buildings during the day and at night. It has been recorded in the vicinity of the Pinaleño Mountains (Hoffmeister 1986), more than 15 miles southwest of the project area.

Oak woodland habitats are not present within the project area, but the project area is within the summer range of this species in Arizona as shown by Hoffmeister (1986) and habitats appear suitable for foraging. Although not expected to utilize habitats for roosting or breeding, it is possible that the fringed myotis may occasionally visit the project area.

Yuma Myotis (*Myotis yumanensis*) is a BLM sensitive species but is not listed by the AGFD. Yuma myotis is found throughout Arizona, except for the northeastern corner. It has been found in desert, grassland, woodland, and riparian communities, but appears to be absent from higher boreal forests. Yuma myotis prefer to occupy buildings or bridges, rarely roosting in mines or caves. Females congregate in small maternity colonies consisting of about 35 individuals. In summer, Yuma myotis are found in areas where water is present over which they forage for food (Hoffmeister 1986). This species has been recorded in the vicinity of Safford (ibid.) about 10 miles from the project area.

Although desertscrub and grassland habitats within the project area appear typical of those known to be used by this species, these areas lack suitable foraging habitat; i.e. extensive open water adjacent to suitable roost sites. However, it is possible that the Yuma myotis occasionally may visit the project area.

Cave Myotis (*Myotis velifer*) is a BLM sensitive species but is not listed by the AGFD. This bat generally inhabits mine shafts, tunnels, and caves, but may also roost under bridges. It is usually found in desertscrub habitats. Roosts are occasionally found in pine/oak vegetation. The majority of the Arizona population migrates to Mexico for the winter, with small numbers remaining in extreme southeastern Arizona. In the project area, more than 100 *Myotis velifer* were observed at site 12 (Figure 3-14). The floor of the adit was approximately 80 percent covered with guano, and entry past 200 feet was unsafe because of ammonia fumes from the guano. More than 200 cave myotis were observed at site 3; at least eight at site 5; five at site 6; and at least four at site 21 (Figure 3-14). A colony of cave myotis has also been reported near Thatcher (Hoffmeister 1986) within about 10 miles of the project area.

Allen's (Mexican) Big-eared Bat (*Idionycteris phyllotis*) is a BLM sensitive species but is not listed by the AGFD. Summer records of this bat in Arizona are mostly from Ponderosa Pine Forest, Pinyon-Juniper Woodland, Madrean Evergreen Woodland, and Mohave Desertscrub. Nursery and maternity colonies are known from mine tunnels and caves. This bat is not known from the project area; the nearest known locality is near Klondyke, approximately 40 miles to the west (Hoffmeister 1986). This species is unlikely to occur regularly in the project area, though it may visit occasionally.

3.2.3.4 Biodiversity

Biodiversity is variously defined as the total number of kinds of organisms (usually species) in an area or some measure combining the number of kinds of organisms with some measure of their relative abundances. Measurements of biodiversity are typically based on only a partial list of organisms present in an area, generally the larger, more conspicuous organisms such as vertebrates. In many cases, biodiversity is inferred from the numbers and kinds of plant communities in an area, with the assumption that a greater number of plant communities supports a greater biodiversity. This simple index of biodiversity is practical because the cost of inventorying all species that occur in an area is usually prohibitive. More complete measures of biodiversity require a large team of specialists working over many seasons over many years. Though useful, the number of plant communities provides only a rough index to biodiversity since plant community classifications are subjective and can be made at many different scales. Furthermore, not all units of classification support the same numbers of species. Thus, any two scientists delineating plant communities in a given area can arrive at two very different, but equally valid classifications.

Measurements of biodiversity are extremely scale-dependent. A well-known biological relationship is the species-area curve, which typically shows that the number of species increases with the size of the area surveyed. Most often, the number of species does not increase in direct proportion to area. The rate of additional species usually increases sharply with a small area and gradually tapers off with larger areas.

For conservation purposes, biodiversity is usually measured over relatively large areas. Federal and state lists of "endangered species" or "species of management concern" are typically developed from a global, national, or state perspective. The goals of such lists are typically to prevent the extinction of the listed taxa, not to maintain existing population levels of all species.

No total measure of biodiversity in the project area was made. Instead, two standard approaches were taken to evaluate potential impacts to biological resources: 1) a general plant community classification and 2) a thorough evaluation of special interest species. Because the project area consists primarily of creosotebush-dominated Sonoran Desertscrub and Semidesert Grassland habitat, and because most riparian habitats are poorly developed, overall biodiversity is expected to be low based on comparisons with other habitats in southeastern Arizona. Measurements of perennial plants confirmed that relatively few species are present in the project area (SWCA 1997g). Evaluations and surveys indicate that few special-interest species are expected to occur regularly in the project area. As with virtually any area, the geographic limits of some species are likely to occur within or near the boundary of the project area. Such limits are not typically considered in evaluations of the biology of an area precisely because they are typical of most areas.

3.2.4 Cultural Resources

3.2.4.1 Historic and Prehistoric Archaeological Resources

On the BLM-managed, federal lands in the project area, historic and prehistoric archaeological resources are subject to provisions of the National Historic Preservation Act, as amended (NHPA) and other pertinent federal statutes. Indian burials on these lands are subject to provisions of the Native American Graves Protection and Repatriation Act (NAGPRA). On PD-owned and state lands in the project area, however, archaeological resources are not protected by federal law unless an action on these lands requires federal authorization of some kind (e.g., issuance of a permit under the Clean Water Act by the EPA or the COE). Indian burials on non-federal lands are not protected by NAGPRA under any circumstances. Arizona state law does provide a measure of protection—not to archaeological resources *per se* on private land—but to human remains and burial goods that might incidentally be associated with archaeological sites. Arizona Revised Statute 41-865 requires (with certain exemptions) private landowners to follow specific notification and treatment procedures when human remains have been encountered on their property.

Between 1992 and 1996, a 26,527-acre study area that includes federal, PD-owned, and state lands in the project area was surveyed for historic and prehistoric archaeological resources (SWCA 1997b). Surveys were conducted according to protocols specified by the BLM and Arizona State Museum (ASM). Total coverage was achieved by walking in parallel transects no more than 20 m (about 60 feet) apart. Terrain that was not traversable, such as vertical-sided ridgetops, was covered by irregularly spaced transects or by visual inspection with binoculars from a distance (SWCA 1997b).

Within the study area, 117 sites were recorded, including 56 prehistoric sites, 41 historic sites, 10 multicomponent sites, and 10 sites of unknown temporal association. Of these 117 sites, 106 are considered to be potentially eligible for nomination to the National Register of Historic Places (National Register) for their scientific values. The remaining 11 sites are thought to be ineligible because they are not archaeologically significant. Sites officially determined by the BLM and the Arizona State Historic Preservation Office to be eligible for the National Register will be subject to mitigation requirements under NHPA prior to any federal action. Of the 117 sites, 61 are located solely on federal property (the selected lands), 52 are located solely on PD property, 3 are located partially on federal property and partially on PD property, and 1 is located solely on state property. A list of the 117 sites, divided by land ownership and including a brief description, temporal affiliation, land management status, and potential National Register eligibility, is provided in three tables in Appendix D of this document (SWCA 1997b).

The prehistoric sites and site components found in the project area include rock features (30 sites), lithic scatters (20 sites), mixed artifact scatters (12 sites), petroglyphs (11 sites), lithic procurement localities (7 sites), rock shelters (2 sites), ceramic scatters (2 sites), and water control features (1 site). Each site or site component could be composed of just one of these elements or two or more of these elements. The historic sites and site components include evidence of mining activity (18 sites), water control features (11 sites), artifact scatters (9 sites), camps (8 sites), rock features (8 sites), corrals (2 sites), a water tank (1 site), a habitation (1 site), and road segments (1 site) (SWCA 1997b).

For the most part, surveyors found sites to be in good to excellent condition, with their archaeological integrity apparently intact. Observed disturbances were generally minor and limited to only a few sites. Impacts resulting from human activity included disturbance by bull dozers or other earth moving equipment (sites AZ CC:2:153, 158, 166, 213, 251); construction and maintenance of a radio tower (AZ CC:2:214); and surface clearing and possible looter pits (AZ CC:2:154). Observed deterioration resulting from natural processes included minor and moderate surface erosion (AZ CC:2:186, 259); erosion of historic water control features (AZ CC:2:263, 275, 277); disturbance by plant growth (AZ CC:2:259); rock fracturing from freezing

and thawing (AZ CC:2:152); and general weathering of surface artifacts, including, but not limited to, rusted and corroded metal objects, decomposing wooden and leather objects, and worn sherds (SWCA 1997b).

Most sites within the project area have the potential to contribute knowledge about both prehistoric and historic human activities in the Safford Valley. The most interesting and suggestive prehistoric site characteristics identified during the surveys include:

- a low occurrence of ceramic artifacts, which were found in limited numbers and at only nine sites;
- a relatively low occurrence of formal tools, including projectile points (only eight confirmed points and two possible point fragments from nine sites);
- several lithic procurement sites (AZ CC:2:194, 199, 205, 210, 212, 213, 214); and
- the presence of artifacts identified as possibly dating from the Archaic period (7500 B.C.-A.D. 300) (AZ CC:2:155, 188, 203).

Potential exists for increasing our understanding of the chronology of prehistoric occupation in the region; patterns of settlement and movement; resource exploitation, including plant and lithic procurement and hunting; subsistence and diet; and lithic technology. Of particular interest is the possibility that one or more sites in the project area could shed light on occupation and activities during the Archaic period in the Safford Valley, of which little is known. Most of the previously studied sites in the region have been ascribed to the Formative period (A.D. 200-1450) of the Mogollon and/or Hohokam culture groups (SWCA 1997b). This pattern likely holds true for sites in the project area as well, although little diagnostic material was found during the surveys (SWCA 1997b).

Apachean people are known to have used the general area as winter camps since early historic times, and four sites in the project area (AZ CC:2:154, 159, 169, and 170) were identified as including features that may be Apachean. If so, these sites, and possibly others, offer the opportunity to examine a culture and time period rarely encountered in the archaeological record. Apache sites certainly exist, but they are difficult to find and identify. Traditional Apache lifeways left behind few material remains, and very little of that is diagnostically Apachean.

Later historic sites in the project area have potential for increasing our understanding of the mining technology used in the area; the relationships of local mining activity and regional socioeconomic and transportation systems; and the lifeways of early miners, including their living arrangements, material culture, and diet. Historic water control sites may contribute information about Civilian Conservation Corps (CCC) activities in the area during the Depression era, including construction methods used, the geographical extent and nature of CCC projects, and how those projects related to livestock grazing at the time of construction.

3.2.4.2 Traditional Cultural Properties Identified by Indian Tribes

For this Project, 11 Indian tribes were consulted regarding the presence or absence of known traditional cultural properties[17] in the project area per the requirements of NHPA (Table 3-19). The 11 tribes were also asked about places sacred to them that might warrant consideration under the American Indian Religious Freedom Act (AIRFA) and Executive Order 13007. Most of the tribes consulted consider the lands in the

[17] National Register Bulletin 38 defines a traditional cultural property as a property that may be "eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1989).

Table 3-19. Indian Tribes Consulted for the Proposed Dos Pobres/San Juan Project, Dates of Meetings, and Field Visits

Tribes	Meeting Dates	Field Visit Dates
Fort Sill Apache Tribe	-	-
Four Southern Tribes*	December 14, 1995 December 20, 1996**	September 20, 1995 March 16, 1996 May 19, 1997
Hopi Tribe	August 17, 1995	February21, 1996
Mescalero Apache Tribe	-	-
Navajo Nation	-	-
Pueblo of Zuñi	-	-
San Carlos Apache Tribe	September 20, 1994 December 7, 1994	June 9, 1997
White Mountain Apache Tribe	July 19, 1995 May 21, 1997	June 23, 1997

* The Four Southern Tribes are the Ak-chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and Tohono O'odham Nation.

** Meetings were also held individually with the Gila River Indian Community on September 2, 1994; October 19, 1994; and December 13, 1994.

Source: SWCA 1997k

project area to be part of their historic aboriginal territory, or they claim ancestry to the prehistoric peoples who occupied these lands (SWCA 1997k). Properties identified during consultation that are officially determined by the BLM and the Arizona State Historic Preservation Office to be eligible for inclusion in the National Register of Historic Places as Traditional Cultural Properties will be subject to mitigation requirements under the NHPA prior to any federal action. Sites identified during consultation as being sacred places may warrant consideration by the BLM under AIRFA and Executive Order 13007.

The consultation process, which began in the fall of 1994 and continues to the present, has included a review of published literature regarding Native American use of the Safford vicinity; correspondence and telecommunications with each of the 11 tribes requesting their concerns regarding places of traditional importance in the project area; and meetings with tribal personnel and visits to the project area as reported in Table 3-19. Each tribe was sent a copy of the archaeological inventory report and a videotape showing the project area and some of the identified archaeological sites. Copies of other archaeological reports related to the Project were made available to the tribes as well (SWCA 1997k).

Early in the consultation process, representatives of the Navajo Nation indicated that the Navajo had no knowledge of traditional cultural places in the project area; therefore, consultation with that tribe is considered complete. Consultation with the remaining ten tribes is ongoing.

To date, eight tribes have reported a total of 74 sites in the project area to be traditional cultural properties. These sites, which are all recorded prehistoric archaeological sites, are listed in Table 3-20. The Five Southern Tribes (the Tohono O'odham Nation and the Ak-chin, Gila River, and Salt River Pima-Maricopa Indian Communities) identified 14 archaeological sites as being traditional cultural properties; the White Mountain Apache Tribe identified 3; and the San Carlos Apache Tribe, the Hopi Tribe, and the Pueblo of Zuñi each identified 74. Of the 74 sites, 41 are located on BLM-administered federal land and 33 are located on PD land.

Table 3-20. Places of Traditional Importance Identified by Tribes in the Project Area

ASM Site No. Prefix = AZ CC:2:	Site Type	Tribe				
		Ak-chin Indian Community Gila River Indian Community Salt River Pima-Maricopa Indian Community Tohono O'odham Nation	White Mountain Apache Tribe	San Carlos Apache Tribe	Hopi Tribe	Pueblo of Zuni
132	rock features	-	-	X	X	X
146	petroglyph	X	-	X	X	X
147	petroglyph, rock shelter, lithic scatter	X	-	X	X	X
148	rock feature	-	-	X	X	X
149	petroglyph	X	-	X	X	X
150	petroglyph	X	-	X	X	X
151	lithic scatter	-	-	X	X	X
152	petroglyph	X	-	X	X	X
153	sherd and lithic scatter	-	-	X	X	X
154	rock features	-	-	X	X	X
155	lithic scatter	-	-	X	X	X
156	petroglyph	X	-	X	X	X
157	petroglyph	X	-	X	X	X
158	petroglyph	X	-	X	X	X
159	rock features	-	-	X	X	X
160	rock features, lithic and groundstone scatter	-	-	X	X	X
164	rock feature, lithic and groundstone scatter	-	-	X	X	X
166	petroglyph, rock feature	X	-	X	X	X
168	lithic and groundstone scatter	-	-	X	X	X
169	rock features, sherd and lithic scatter	-	-	X	X	X
170	lithic and groundstone scatter	-	-	X	X	X
171	lithic scatter, quarry	-	-	X	X	X
186	sherd and lithic scatter	-	-	X	X	X
188	sherd and lithic scatter	-	-	X	X	X
191	lithic and groundstone scatter	-	-	X	X	X
192	lithic scatter	-	-	X	X	X
193	rock alignments, terraces	-	-	X	X	X
194	lithic procurement	-	-	X	X	X
195	lithic and groundstone scatter	-	-	X	X	X
196	sherd and lithic scatter	-	-	X	X	X
199	lithic procurement	-	-	X	X	X
200	hill, rock rings	X	X	X	X	X
201	lithic scatter	-	-	X	X	X

Table 3-20 (continued). Places of Traditional Importance Identified by Tribes in the Project Area

ASM Site No. Prefix = AZ CC:2:	Site Type	Tribe: Ak-chin Indian Community Gila River Indian Community Salt River Pima-Maricopa Indian Community Tohono O'odham Nation	White Mountain Apache Tribe	San Carlos Apache Tribe	Hopi Tribe	Pueblo of Zuni
205	lithic procurement	-	-	X	X	X
210	lithic procurement	-	-	X	X	X
211	rock ring	X	X	X	X	X
212	lithic procurement	-	-	X	X	X
213	lithic procurement	-	-	X	X	X
214	lithic procurement	-	-	X	X	X
215	lithic scatter, rock piles	-	-	X	X	X
217	lithic scatter	-	-	X	X	X
218	rock pile	-	-	X	X	X
219	lithic scatter	-	-	X	X	X
220	rock piles	-	-	X	X	X
221	lithic scatter	-	-	X	X	X
222	rock piles	-	-	X	X	X
223	rock features	-	-	X	X	X
225	rock piles	-	-	X	X	X
226	rock ring	X	-	X	X	X
227	rock pile	-	-	X	X	X
228	sherd and lithic scatter, habitation?	-	-	X	X	X
229	rock piles	-	-	X	X	X
231	rock piles, petroglyphs	X	-	X	X	X
233	rock piles	-	-	X	X	X
234	rock shelter, rock pile	-	X	X	X	X
241	petroglyph	X	-	X	X	X
245	rock feature	-	-	X	X	X
246	lithic scatter	-	-	X	X	X
249	rock features, lithic scatter	-	-	X	X	X
253	rock features, lithic scatter	-	-	X	X	X
254	rock features, lithic scatter	-	-	X	X	X
255	rock feature	-	-	X	X	X
257	rock features, sherd and lithic scatter	-	-	X	X	X
259	sherd scatter	-	-	X	X	X
264	lithic scatter	-	-	X	X	X
266	rock features	-	-	X	X	X
267	rock features, lithic scatter	-	-	X	X	X
268	sherd scatter	-	-	X	X	X
269	rock features, lithic scatter	-	-	X	X	X
270	lithic scatter, rock ring	-	-	X	X	X

Table 3-20 (continued). Places of Traditional Importance Identified by Tribes in the Project Area

ASM Site No. Prefix = AZ CC:2:	Site Type	Tribe: Ak-chin Indian Community Gila River Indian Community Salt River Pima-Maricopa Indian Community Tohono O'odham Nation	White Mountain Apache Tribe	San Carlos Apache Tribe	Hopi Tribe	Pueblo of Zuni
271	rock features, lithic scatter	-	-	X	X	X
272	rock features, lithic scatter	-	-	X	X	X
273	rock features, lithic scatter	-	-	X	X	X
274	rock feature, lithic scatter	-	-	X	X	X

To date, Indian tribes have identified prehistoric archaeological sites in the project area as being traditional cultural properties for three reasons: the site is considered ancestral; the site is considered sacred; and/or the site is thought to include a Native American grave. All tribes consulted indicated concern about the treatment of human remains and associated funerary objects that may be located within the project area. As of the date of this document, one possible Native American grave site has been identified in the project area and may warrant protection under the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, as amended.

Information offered by the tribes thus far is sufficient to suggest that two of the archaeological sites mentioned above (AZ CC:2:200 and 211) may be eligible for the National Register for their traditional values (i.e., as Traditional Cultural Properties) as well as their scientific values, although the BLM and Arizona State Historic Preservation Office have yet to make their eligibility determination. One of the archaeological sites (AZ CC:2: 211) identified by Indian tribes as being a traditional cultural property is also considered to be sacred by the White Mountain Apache Tribe. Two of the sites (AZ CC:2:200 and 211) are considered to be sacred by the Tohono O'odham Nation and the Ak-chin, Gila River, and Salt River Pima-Maricopa Indian Communities. All prehistoric archaeological sites in the project area are considered sacred by the Hopi Tribe and the Pueblo of Zuñi.

3.2.5 Socioeconomic Resources

The information reported in this section was taken for the most part from a socioeconomic analysis prepared by ESI Corporation for the BLM (ESI Corporation 1997).

3.2.5.1 Population and Demographics

During a special census conducted in 1995, 29,772 persons were counted in Graham County. The Arizona Department of Economic Security estimated a population of 31,150 for 1996, and has projected a population of 32,243 for 1997. The county ranks 12th out of 15 counties in the State of Arizona for population density. About half of the residents live in the communities of Safford, Thatcher, and Pima in the Safford Valley. Neighboring Greenlee County, where PD's Morenci Mine is the principal employer and many residents of Graham County work, is also sparsely inhabited with a projected 1997 population of 8,650.

Population growth in Graham County has accelerated over the last 20 years. Between 1977 and 1987, the population grew from approximately 21,000 to 24,700, an increase of 17.6 percent. Between 1987 and 1995, the population increased by 20.5 percent. Projected figures for the next nine years, as approved by the Arizona Department of Economic Security in February 1997, are presented in Table 3-21.

Table 3-21. Estimated Future Population in Graham County

Year	Projected Population	Year	Projected Population
1997	32,243	2002	36,880
1998	33,263	2003	37,741
1999	34,245	2004	38,584
2000	35,164	2005	39,427
2001	36,029		

Source: 1990 Census (ESI Corp, 1997)

By comparison, from 1977 to the present, the population of Greenlee County has decreased. Between 1977 and 1987, the population shrank from approximately 11,900 to 9,600, a decrease of 19.3 percent. Between 1987 and 1995, the population further decreased by 11.5 percent. The downward trend has reversed, however, and modest growth is expected in Greenlee County over the next decade.

According to the 1990 Census, 54.3 percent of the population of Graham County were aged 18-64 (working age), and 12.6 percent were over the age of 65.

3.2.5.1.1 Minority Groups and Low-Income Populations. Minority groups and low-income populations are specifically considered in this document as part of compliance with Executive Order 12898 regarding Environmental Justice.

According to the Special 1995 Census, approximately 73.5 percent of the population in Graham County identified themselves as White, 15.4 percent as Native American, 8.6 as Other, 1.9 percent as Black, and 0.5 percent as Asian. In answer to a separate question, 25.2 percent of individuals who had already identified themselves as belonging to one of the aforementioned groups further identified themselves as being of Hispanic origin. Between 1990 and 1995, while the overall population in the County increased by 12.1 percent, the Native American population increased by 16.3 percent, the Black population by 12.9 percent, and the Hispanic population by 12.2 percent.

Based on census data, the three Graham County census block groups[18] in which more than 100 Native American persons live coincide with the San Carlos Apache Reservation, with concentrations of Native Americans centered in the towns of Bylas and Peridot. Census block groups that include portions of Thatcher; portions of Safford; and the towns of Solomon, San Jose, and Sanchez contain the greatest concentrations (more than 300 persons) of persons identifying themselves as of Hispanic origin. The locations of these communities relative to the project area are depicted in Figure 3-15.

Low-income populations are defined for this analysis as census block groups in which the percentage of households with an annual income of less than $15,000 is equal to or greater than 40 percent. About half (17) of the 33 census block groups in Graham County fall into this category. They encompass most of the northern half and the southwestern quarter of the County, as well as about a third of the City of Safford and

[18] Census block groups by definition contain roughly 1,000 persons, although the 33 block groups in Graham County that were censussed in 1990 contained from 29 to 2,261 persons.

most of the Town of Pima. Census block groups with the highest proportion of low-income households are located within the San Carlos Apache Reservation (49, 59, and 82 percent); just outside the boundary of the Reservation (56 percent); and within pockets in the communities of Safford (52 and 55 percent), Thatcher (47 and 50 percent), and Pima (49 percent). The distribution of low-income populations relative to the project area is depicted in Figure 3-15. No developed residential areas are located within five miles of the proposed pits, leach pad, and development rock stockpiles.

3.2.5.2 Local and Regional Economy

The local economy in the Safford area, which includes the communities of Safford, Thatcher, and Pima (all within six miles of each other), is driven by agriculture, wholesale and retail trade, government employment, and tourism. Farming and ranching have been important in the area since the Upper Gila River Valley was first settled by Anglo Americans in the early 1870s. Some 40,000 irrigated acres are under cultivation, primarily with cotton. Safford has also long been the chief market for a widespread region that includes all of Graham and Greenlee counties, part of northern Cochise County, and rural areas across the state border in western New Mexico. The copper-mining communities of Clifton and Morenci in Greenlee County are particularly important as a source of out-of-county consumers for Safford retail businesses. In turn, the Morenci Mine provides employment for many residents in the Safford area.

In recent decades, government employment has become increasingly important locally. This is principally attributable to two Arizona state prisons and one federal prison located near Safford. Safford is also the county seat of Graham County and the site of several federal offices serving the region. The newest industry to affect the area in a significant way is tourism, as increasing numbers of visitors discover the scenic beauty and recreational opportunities offered by the region's mountains and forests, the Gila River, and the upland desert terrain. This growing economic component fuels retail trade and lodging, restaurant, and other service sectors of the local economy. Commercial infrastructure for tourism (i.e., lodging, restaurants) is highly concentrated in Safford. Important tourist attractions within Graham County include but are not limited to:

- Mt. Graham and Riggs Lake in the Coronado National Forest Pinaleño Mountains
- San Carlos Lake
- Roper Lake State Park
- Hot Well Dunes Recreation Area
- Black Hills Rockhound Area
- Black Hills Back County Byway
- Discovery Park
- Gila Box RNCA, including Bonita Creek and its tributaries
- Aravaipa Canyon Wilderness
- hot springs

While none of these attractions by itself is important as either a generator of tourist traffic or as a source of regional income, together they provide a diversity of recreational opportunities that support potential future increases in the regional tourism industry.

3.2.5.2.1 Employment. According to the Arizona Department of Economic Security, the civilian labor force in Graham County in 1996 totaled 11,425 individuals. Of these, 10,325 were employed and 1,100 were unemployed, an unemployment rate of 9.7 percent. In the same year, neighboring Greenlee County had a civilian labor force of 5,075 and an unemployment rate of 8.1 percent. The highest unemployment rates in Graham County occur on the San Carlos Apache Reservation, which was reported in the 1995 Arizona Statistical Review to have a an unemployment rate of 22 percent overall. Bylas, Arizona, the Reservation community closest to the project area, has an unemployment rate of 26.2 percent.

Of the 10,325 employed persons in Graham County in 1996, 7,100 (68.8 percent) were non-agricultural wage and salary employees, and 3,225 (31.2 percent) were either self-employed (often in agriculture), worked for wages in agriculture, or worked outside the county (Table 3-22). The non-agricultural wage and salary employment within the County was dominated by government jobs (46.5 percent), reflecting the importance of the prisons as an industry in the area. Wholesale and retail trade accounted for 25.4 percent of jobs, services for another 15.5 percent. Graham County has a diversified economy when compared to Greenlee County, which has about 40 percent employment in the mining sector.

Table 3-22. Employment Structure in Graham County, 1996

Employment Sector	No. of Persons	% of Total
Non-Agricultural Employment		
Government	3,300	46.5%
Trade	1,800	25.4%
Services & Misc.	1,100	15.5%
Construction	300	4.2%
Manufacturing	200	2.8%
TCPU*	200	2.8%
FIRE**	200	2.8%
Subtotal of Non-Agricultural Employment	**7,100**	**68.8%**
Agriculture, Self-employment, Out-of-county Employment	**3,225**	**31.2%**
TOTAL	**10,325**	**100%**

*TCPU = Transportation, Communications, and Public Utilities
** FIRE = Finance, Insurance, and Real Estate
Source: ESI Corporation 1997

3.2.5.2.2 Income. Both median household and per capita income are low in Graham County. In 1990, the county ranked 13 out of the 15 counties in Arizona for both measures, with a median household income of $18,445 and a median per capita income of $8,955. This compares to the state medians of $22,066 and $9,794 for household income and per capita income, respectively. According to the 1990 Census, Graham County had the fourth highest rate of persons in poverty (26.7 percent) of all counties in the state. About 28.3 percent of individuals through age 64, and 16.3 percent of individuals age 65 and over, were below the poverty line. The low-income figures, in part, reflect the influence of low-paying agricultural jobs, and contrast sharply with income figures for Greenlee County. Despite its small population, in 1990 Greenlee County ranked second only to Maricopa County, the state's most populous county, in highest mean household income ($27,491) and lowest rate of persons in poverty (12.6 percent). The high income figures can be attributed to relatively high-paying mining jobs.

3.2.5.2.3 Taxes. Several sources of revenue for the county and municipal governments in Graham County would be affected by the alternative actions analyzed in this EIS. These sources include locally collected property and sales taxes; distributions from the State of Arizona to local governments of revenue produced by the Transaction Privilege, Use and Severance Tax and by state income taxes; and payments in lieu of taxes (PILT) paid by the federal government to local governments for federal lands which generate no county property taxes.

Private property taxes collected directly by the county and by municipalities are an important source of locally-based revenues. The property taxes are collected on assessed property values. The percent of total

net assessed value by property class in Graham and Greenlee Counties is compared in Table 3-23. In Graham County, total net assessed value ($68,846,902) is only one-third that of Greenlee County ($228,467,780), even though Graham County is larger in area and population than Greenlee County. The difference is the relatively higher assessed value on patented mining property, which accounts for almost 87 percent ($198,579,797) of the property tax base in Greenlee County. In Graham County, the property tax base—principally residential, commercial, and agricultural property—is more diversified and of lower cash and assessed value.

Table 3-23. Percent of Net Assessed Property Values by Class in Graham and Greenlee Counties

Property Class Description*	GRAHAM COUNTY % of Total Net Assessed Value ($68,846,902)	GREENLEE COUNTY % of Total Net Assessed Value ($228,467,780)
Mines	0.2%	86.92%
Commercial	25.7%	1.6%
Agricultural	20.8%	0.85%
Residential	41.56%	3.32%
Other	11.67%	7.3%

*The property classes actually used for valuation have been grouped for purposes of this table.

The State of Arizona collects revenue from businesses in the state via a Transaction Privilege, Use and Severance Tax. Portions of this revenue are returned to each county by a formula based on both the total amount of collections in that county and the proportion of the state population represented by that county. Disbursements are also made to municipalities, but these payments are based solely on population. Table 3-24 lists the taxable activities and businesses, taxable income, and tax collections for Graham and Greenlee counties for fiscal year July 1, 1994-June 30, 1995. The state also collects income taxes and distributes portions of this revenue to incorporated cities and towns as "revenue sharing."

The numbers presented in Table 3-24 illustrate some of the fundamental differences between the economies of Graham and Greenlee counties. In Graham County, retail services dominated tax collections with 59.3 percent. This reflects Safford's role as the retail shopping center for the region. In Greenlee County, the category "Other Taxable Activities," which includes mining, dominated with 79.8 percent. This percentage reflects the preeminent position of the Morenci Mine in the economic structure of the county, while the dollar amount ($14,442,571) demonstrates the mine's capacity to generate public revenue. In Greenlee County, this category alone produced almost 60 percent more Transaction Privilege, Use and Severance Tax revenue than all the categories combined in Graham County. The figures presented in Table 3-24 also illustrate the greater diversity in Graham County's economic base compared to that of Greenlee County.

Table 3-25 shows the distribution of Transaction Privilege, Use and Severance Tax revenue by the state to county governments in 1994-1995. Once again the figures illustrate economic differences between Graham and Greenlee counties, particularly the economic impact of taxes paid by PD's Morenci Mine on county revenues. Compared to Graham County, Greenlee County's disbursement is twice as high, even though Graham County's population is three and one-half times larger. This disparity means that the benefit from this tax source to each resident of Greenlee County is seven times greater than that to each resident of Graham County.

Table 3-24. Transaction Privilege, Use and Severance Tax Collections, Graham and Greenlee Counties, July 1, 1994-June 30, 1995

GRAHAM COUNTY Taxable Activities and Business Classifications	Net Taxable Income	Collections	% of Collections from County	% of Total Collections, Statewide
Communications	$ 4,570,420	$ 228,521	2.5%	
Restaurants/Bars	13,755,771	687,789	7.5%	
Commercial Leases	3,781,983	117,102	1.3%	
Rentals of Personal	5,168,130	258,407	2.8%	
Property	22,882,300	1,144,115	12.4%	
Contracting (All)	109,138,042	5,456,902	59.3%	
Retail	26,102,843	1,315,075	14.3%	
Other Taxable Activities				
TOTAL	**$185,399,489**	**$9,207,911**		**0.36%**

GREENLEE COUNTY Taxable Activities and Business Classifications	Net Taxable Income	Collections	% County Collections	% of Total Collections, Statewide
Communications	$1,398,317	$69,916	0.4%	
Restaurants/Bars	3,742,304	187,115	1.0%	
Commercial Leases	408,357	12,673	0.1%	
Rentals of Personal	693,048	34,652	0.2%	
Property	19,886,371	994,319	5.5%	
Contracting (All)	47,101,798	2,355,090	13.0%	
Retail	516,534,389	14,442,571	79.8%	
Other Taxable Activities				
TOTAL	**$589,764,584**	**$18,096,336**		**0.71%**

Table 3-25. Distribution of Transaction Privilege, Use and Severance Tax Revenue by the State of Arizona to Graham and Greenlee Counties in 1994-1995

Counties	Distribution Amounts	Per-capita, 1995	Population, 1995	% of All Distributions	% of Population
Graham	$1,868,969	$62	30,025	0.52%	0.71%
Greenlee	$3,756,460	$442	8,500	1.05%	0.20%
All Counties	$356,339,290	$84	4,228,900	100%	100%

Another source of revenue for county governments that would potentially be affected by the Project is "payments in lieu of taxes" (PILT) made by the federal government to offset the limited property tax base that results from federal land ownership. These payments are established, and limited in the total amount payable to any one county, by a complex set of formulas involving the county's population, acreage of certain classes of federal lands, amounts of other federal payments to the county, and other variables. Population is a determining factor in setting limits (ceilings) for payments made to local governments. Currently, the BLM makes payments in lieu of taxes in the amount of $19,634 to Graham County for the land surrounding the proposed Dos Pobres/San Juan Project on the basis of $1.16 per acre (ESI 1997); the rate may change from year to year. In 1996, Graham County received $729,957 in total PILT.

3.2.5.3 Infrastructure

The rapid population growth (33 percent) in the Safford area over the past decade has put pressure on the existing infrastructure and those who staff it (ESI 1997). This growth has created a need for mid-priced housing; expanded and improved sewer facilities; a new source of electric power; new school facilities; and additional city, county, and school system staff. Additional health care professionals are needed as well.

3.2.5.3.1 Housing. The housing conditions in Graham County are somewhat atypical, compared to the rest of Arizona. Graham County ranks second in the percentage of owned and rented units built prior to 1980, indicating that the housing stock is fairly dated when compared to the rest of Arizona. According to the 1990 Census, Graham County had 5,976 (56 percent) individuals owning or renting housing units built prior to 1980 (ESI 1997, Appendix A-13). Median values for owner-occupied homes ($51,300) and rents paid ($221/month) in Graham County are among the state's lowest.

In the second half of 1996, 121 homes were sold on the new and resale markets in the Safford area. In January 1997, approximately 75 houses were on the resale market; about 45 percent of these were listed for less than $80,000. The supply of older, pre-owned, less expensive houses appears to meet the demand at the lower price range of the market. No new low-income housing or high-density housing is being planned. Few rental opportunities are available.

Four developers are currently building housing projects to meet a shortfall in the mid to upper ranges of the market. Approximately 263 new homes are planned in the $85,000 and above range; the average new home price is $102,000. The City of Safford's "tentative plan" for future new water hook-ups includes 350 housing units at one project, 400 at another, and several hundred more at other locations (ESI 1997).

3.2.5.3.2 Utilities. The City of Safford recruited a director for the city's utilities operation. Officials are now gathering data on staffing needs in that department to take care of deferred maintenance.

- **Water.** The City of Safford provides domestic water for its own residents, for the nearby Town of Thatcher, and for smaller, unincorporated areas in the immediate vicinity. This water is drawn from Bonita Creek. Currently serving a peak demand of 4,000 gpm (ESI 1997), city officials are seeking to obtain new water supplies to augment their existing water right for 3,240,000 gallons per day (gpd) (3,584.5 ac-ft/yr) (H. West, Hydrologist, BLM, pers. comm.). In order to address water issues, particularly the ongoing adjudication of Gila River water rights, the city has retained a hydrogeologist. Determining Gila River water rights is a long-term undertaking affecting many central Arizona communities and Indian tribes. Domestic water for the Town of Pima and adjacent unincorporated areas is provided by Graham County Utilities, Inc. Domestic water for all other unincorporated areas in the county is provided by small, private water systems. Water for irrigation is supplied by the Gila Valley Irrigation District. The city is committed to providing water service to 425 new residential, commercial, and other sites by Fiscal Year 1997-1998.

- **Electric/Gas**. Currently, electrical power in Safford is provided by the city. All other areas of the eastern Gila Valley are serviced by one of two utility companies: Graham County Utilities, Inc. or Graham County Electric Cooperative, Inc. This electricity is generated at a coal-fired power plant near Willcox, Arizona. A new power plant that would employ 35-40 employees upon completion has been proposed for the Safford area but is still in the "drawing board" stage. Natural gas service for the entire area is provided by Graham County Utilities, Inc. or Graham County Electric Cooperative, Inc. They distribute gas supplied by the El Paso Natural Gas Company.

- **Sewer.** City voters approved in May 1997 a bond sale to fund construction of a new wastewater treatment plant with a maximum capacity of three million gpd. The facility could be operational by

late 1998 or early 1999. The current facility's capacity of 738,000 gpd should suffice until then (J. Davies, City of Safford, pers. comm.). The Town of Thatcher is presently upgrading its sewer system and expanding the system's capacity from 350,000 gpd to 1 million gpd.

- **Telephone.** Telephone service in the Safford Valley is provided by US West Communications.

- **Garbage.** Currently, the City of Safford owns three sideload trucks, two rearload trucks, and one open-bed truck. There are seven full-time employees in the sanitation department, and the city plans to hire one additional driver plus one truck within the next five years. The city uses the county landfill and pays a share of its maintenance cost (L. Lopez, Safford City Planner, pers. comm.). At this time, the landfill has capacity for about 20 to 25 more years of use at the current rate of use, but the county would like to purchase an additional 240 acres of adjacent BLM lands to provide another 60 to 80 years of use for future (J. Ward, Graham County Engineer, pers. comm.).

3.2.5.3.3 Schools. There are two school districts in the Safford area: Safford Unified School District and the Thatcher Unified School District. The Safford schools are near capacity, and either a new building or an addition on an existing building will be needed. As of October 1, 1996, the Safford Unified School District had five schools and a total enrollment of 3,043 students:

- 1 primary (pre-school through 2nd grade): 706 students
- 1 intermediate (grades 2-5): 661 students
- 1 middle school (grades 6-8): 685 students
- 2 high schools (grades 9-12): 918 students and 73 students

Thatcher area schools are also at capacity or in need of improvement. The District is building a new high school as of this writing in anticipation of a predicted increase in enrollment by one-third by the year 2000 (ESI 1997).

3.2.5.3.4 Emergency Response. The Safford Police Department employs twelve officers, and has been steadily increasing staff over the past few years to keep pace with the growth of the city. The city's fire department is on a volunteer basis. This service is currently satisfying the needs of the city; expansion of this service is not seen as an immediate issue.

Safford serves as the primary medical hub for Graham and Greenlee counties. The area is currently suffering from a shortage of physicians and nurses. The Mt. Graham Community Hospital in Safford is expanding capacity in a number of areas, including construction of an intensive care unit, with the assistance of Phelps Dodge funds. The hospital has built a new medical office building, a new intensive care unit, and additional operating rooms. The recent expansion should attract high-quality doctors to the area (ESI 1997).

3.2.5.4 Transportation

This section describes the current conditions of roads, intersections, bridges, and air traffic corridors in and near the project area.

3.2.5.4.1 Roads. The unpaved, ranch roads that provide access to the project area are described in Section 3.2.1.2. (see Figure 1-1). The roadways described here are paved segments that are most likely to be affected by the proposed mining activities being analyzed in this EIS. They include the roads and highways listed below; a few key intersections on those roads; and five bridges crossing the Gila River (Figure 3-16). The following roadway segments were studied by Curtis Lueck & Associates (1997) to determine current conditions and anticipated project impacts:

- US Highway 70 (US 70) from the town of Pima east to Sanchez Road
- US Highway 191 (US 191) from US 70 south to Interstate 10
- Safford-Bryce Road
- Airport Road - Eighth Avenue to Sanchez
- Reay Lane - US 70 to Safford Bryce Road
- Sanchez Road from Airport Road to US 70

US 70 is the main highway through the Safford area, paralleling the Gila River on the south side. It connects the communities of Safford, Thatcher, and Pima to each other; to Globe, Arizona, 73 mi west; and eventually to the metropolitan Phoenix area.

US 191, a state-designated scenic route, runs south from US 70 to Interstate 10, providing access to Mount Graham and Roper Lake State Park, both popular recreational areas. It also runs northeast, connecting US 70 to the communities of Clifton and Morenci and to the scenic White Mountains.

Safford-Bryce Road is a rural road that parallels the Gila River on the north side. It runs from Eighth Avenue (City of Safford) northwest to Eden Road (beyond Pima) and is connected to US 70 via Eighth Avenue over the Safford Bridge, Reay Lane over the Thatcher Bridge, Bryce-Eden Road over the Pima Bridge, and Eden Road over the Eden Bridge. The Phelps Dodge Mine Road from the Dos Pobres pit site terminates at Safford-Bryce Road (Figure 3-16). Four at-grade drainage crossings (dip-sections) carry stormwater across Safford-Bryce Road during runoff events. Such crossings can become impassable for short periods.

Airport Road continues the Safford-Bryce Road alignment from Eighth Avenue east to Sanchez Road. It connects to US 70 via Sanchez Road over Solomon Bridge (Figure 3-16). The San Juan Mine, Lone Star Mountain, and Solomon Pass Roads all terminate at Airport Road (see Figure 1-1).

Reay Lane over the Thatcher Bridge and Sanchez Road over Solomon Bridge are the crossings likely to receive the most traffic as a result of proposed mining activities.

Table 3-26 summarizes the condition of these roadway segments, including their operational characteristics, average daily traffic, and level of service (LOS). An LOS rating (LOS A through LOS F) is a qualitative description of how well a roadway operates under prevailing traffic conditions. A rating of LOS A indicates free-flowing traffic, whereas LOS F indicates forced flow and extreme congestion. In communities with a population below 50,000, LOS C is the level used as the planning and design goal. In the Safford transportation area, every roadway segment studied operated acceptably at LOS B or better, with most operating at LOS A (Parsons Brinckerhoff 1992). Most of the major roadways in the Safford area, including all but one of the segments listed above, are considered to be in adequate physical condition for passenger vehicles and commercial shipping (Curtis Lueck & Associates 1997). The exception is the Safford-Bryce Road. Although this road was given a "Fair" rating in a 1992 study (Parsons Brinckerhoff 1992, see Table 3-26), in 1997, portions were described as deteriorating, with pavement failing and edges raveled or poorly defined (Curtis Lueck & Associates 1997).

3.2.5.4.2 Intersections. The following six intersections are those most likely to be affected by proposed mining operations (Curtis Lueck & Associates 1997):

- US 70/Reay Lane (Thatcher): Unsignalized with stop-control on Reay Lane.
- US 70/Eighth Avenue (Safford): Signalized.
- US 70/US 191(Safford): Signalized.
- US 70/Sanchez Road: Unsignalized with stop-control on Sanchez Road.
- Safford-Bryce/Reay Road: Unsignalized "T" configuration with stop-control at Reay Road.

Table 3-26. Current Road Conditions in the Safford Area

Road Segment	Lanes (CLT = Center Left Turn)	Operational Characteristics*	Average Daily Traffic	Year of Count	Level of Service (LOS)
US 70, Main St. (Pima) - Reay Ln.	4+CLT	-	8,000	1995	-
US 70, Reay Ln. - Montieth Ln.	2	Fair	16,800	1995	B
US 70, Montieth Ln. - Sanchez Rd.	2	Good	5,400	1995	B
US 191, US 70 - Old Country Club	4+CLT	Good	7,000	1995	A
US 191, Old Country Club - I-10	2	Good	4,400	1995	A
Safford - Bryce Rd.	2	Fair	1,051	1996	A
Airport Rd.	2	Good	1,800	1996	A
Reay Ln.	2	Fair	600	1994	A
Sanchez Rd.	2	Fair/Good	372	1996	A

* Fair = sufficient sight distances, well-maintained pavement and striping, adequate shoulder, and the overall conditions give the user a sense of comfort and safety. Good = good operational characteristics overall, better than average pavement and striping.
Source: Curtis Lueck & Associates 1997, reporting operational characteristics and LOS data from Parsons Brinckerhoff (1992).

- Safford-Bryce/Eighth Avenue/Airport Road: Unsignalized "T" configuration with stop-control at Safford-Bryce/Eighth Avenue intersection.

The two signalized intersections, US 70/Eighth Avenue and US 70/US 191, were analyzed for level of use in a previous study (Parson Brinckerhoff 1992) and found to be operating well under capacity at that time. None of the unsignalized intersections listed above have been similarly analyzed in that study, but an unsignalized intersection on US 70 just east of Reay Lane (US 70/Stadium Drive) experienced peak-hour congestion in the mornings and afternoons (LOS ratings of E and D, respectively).

3.2.5.4.3 Bridges. Five, two-lane bridges crossing the Gila River provide access to Safford/Bryce and Airport Roads from the south: Eden, Pima, Thatcher, Safford, and Solomon Bridges. None of the bridges carry posted weight restrictions. The Eden, Pima, and Thatcher Bridges have a single, 12-foot-wide through lane in each direction and concrete "Jersey" barriers, with a two- to four-foot-wide shoulder area and no sidewalks. The Solomon Bridge is a new bridge built by the Arizona Department of Transportation and Graham County in 1996. This 810-foot-long bridge has two lanes, with a 30-foot-wide deck and is designed to convey the 25-year flood flow of about 67,000 cfs and to withstand scour during major floods. The Safford Bridge (Eighth Avenue) is an old bridge built during the 1930s. It is narrow, only 23 feet wide, and in a poor state of repair with apparent spalling of the concrete and exposed rebar.

3.2.5.4.4 Air Traffic Corridors. The Safford Municipal Airport adjoins the southern boundary of the project area (Figure 1-2). Airspace restrictions associated with the airport require that air traffic not be obstructed by any object located within a three-dimensional space surrounding the airport. Such an object (e.g., a radio antenna or transmission line pole) would obstruct air traffic if its height were greater than the imaginary upper surfaces defining the three-dimensional space. This space is bounded on top by a roughly circular, flat, imaginary Horizontal Surface that acts as a "ceiling" 150 feet above the airport, and an imaginary Conical Surface that flares upward and outward from the circumference of the Horizontal Surface at a slope of 20H:1V (20 horizontal units to 1 vertical unit) in every direction. The circumferences of these two concentric

"circles" are shown Figure 3-17, and more detailed definitions are presented in Figure 3-18. According to Federal Aviation Administration regulations, the radius of the flat Horizontal Surface must extend no less then 5,000 ft beyond each end of the airport's primary surface (runway), and the radius of the upward-sloping Conical Surface must extend another 4,000 ft beyond the circumference of the Horizontal Surface. At the Safford Municipal Airport, elevations of the Horizontal Surface range from 3,307 to 3,326 feet, paralleling the gentle slope of the primary runway. The Conical Surface on the north side of the airport, where a proposed power transmission line for the Project would be sited, ranges from 3,307 to 3,326 feet at the edge of the Horizontal Surface to 3,507 feet at the outer edge of the Conical Surface. These heights constrain any development within the outer "circle" shown in Figure 3-17 (SWCA 1997h).

3.2.6 Indian Trust Resources

All Department of the Interior bureaus and offices, including the BLM, have a responsibility to protect and maintain Indian Trust Resources (also known as Indian Trust Assets). Secretarial Order 3175 mandates that agencies, "when engaged in the planning of any proposed project or action, will ensure that any anticipated effects on Indian trust resources are explicitly addressed in the planning, decision, and operational documents...that are prepared for that project" (USDI 1993). As part of this responsibility, agencies are required to consult with the recognized tribal government with jurisdiction over the trust property that the proposal may affect, the appropriate office of the Bureau of Indian Affairs, and the Office of the Solicitor if their evaluation reveals impacts to Indian Trust Resources.

Indian trust assets are "legal interests in property held in trust by the United States for Indian tribes or individuals" (BLM 1995). Assets are further defined as "anything owned that has monetary value...[such as] real property, physical assets or intangible property rights" (ibid.). Examples of things which could be trust assets are lands, minerals, and water rights. Trust assets cannot be sold, leased, or otherwise alienated without the approval of the United States.

Indian trust assets pertaining to this Project consist of water rights to the Gila River held by the San Carlos Apache Tribe and by the Gila River Indian Community. These tribes own 6,000 af/yr and 303,288 af/yr (L. Sibala, Hydrologist, BIA, telefax 1998) of water rights to the Gila River, respectively. The Project is located in the Gila River watershed. There are no Indian trust lands, minerals, or other Indian trust assets in the project area.

3.3 OFFERED LANDS

This section provides descriptions of the offered lands proposed for exchange. The 11 properties are grouped as either base or optional properties. Organization follows the major resource categories for the selected lands except for Indian Trust Resources, as none of the 11 properties is Indian trust land, represents a legal interest held in trust by the U.S. for an Indian tribe or individual, or is derived from rights reserved by or granted to an Indian tribe or individual by treaty, statute, or executive order.

3.3.1 Base Package

The base package of offered lands consists of five PD-owned properties: Amado, Curtis, Musnicki, Schock, and Feulner. The Amado and Curtis properties are located within the boundary of the BLM-administered Gila Box Riparian National Conservation Area (RNCA); the Musnicki property borders the BLM-administered Dos Cabezas Mountains Wilderness; and the Schock and Feulner properties lie within boundary of the BLM-administered Empire-Cienega Resource Conservation Area (RCA). The existing natural and human environment of these properties is described below.

3.3.1.1 Amado and Curtis Properties

The Amado and Curtis are separate properties, but because both are located in the Gila Box RNCA, Graham County, Arizona; both straddle Bonita Creek; and portions of the properties adjoin each other; they are described together. Both properties are characterized by undeveloped mountainous terrain paralleling segments of Bonita Creek. This perennial creek flows through a canyon, with small tributary canyons leading down to the heavily vegetated creek floodplain. Elevations range from a low of about 3,800 feet on both properties to about 4,300 feet on the Amado property and about 4,700 feet on the Curtis property (Zenitech 1998b).

3.3.1.1.1 Land Use. Owned by PD, the 180-acre Amado property (with a five-acre exclusion) and 675 acres of the 755-acre Curtis property are inholdings physically encompassed by, but not included in, the 21,767-acre, BLM-administered RNCA (SWCA 1996c). Figure 2-27 shows the Amado and Curtis properties and surrounding land ownership. An approximately 80-acre portion of the Curtis property lies outside of the approved Gila Box RNCA boundary. The 855 acres of both properties within the Gila Box represent about 50 percent of existing private land in-holdings (1,720 acres) and about four percent of the total land (23,487 acres) within the RNCA perimeter. Other private in-holdings within the perimeter account for an additional three percent of the total, while BLM lands account for 93 percent. The outside boundary of the adjoined Amado and Curtis properties totals about 10.9 miles, of which 8.75 miles (or approximately 80 percent) abut BLM lands (ibid.).

These properties are physically accessible via four-wheel-drive roads and trails periodically maintained by the BLM. Four-wheel-drive access is possible from the west via Red Knolls Canyon Road (off Solomon Pass Road), and from the east via Hackberry Spring Road. Nonvehicular access is available from the west via Bushy Canyon Road, or visitors may take Solomon Pass Road to Lee Trail and walk approximately three river-miles up Bonita Creek to the Curtis property and another mile upstream to the Amado property. From the east, nonvehicular access is available via the Safford-Morenci Trail off East Bonita Rim Road, which is a four-wheel-drive road (SWCA 1996c).

Because the properties are private, no public access or public recreation is currently authorized, but PD has not prevented physical access to or public recreation on the properties. Recreational activities on adjacent Gila Box RNCA land, which has similar natural resource values, include, but are not limited to, camping, hiking, bird and wildlife watching, water play, photography, and archaeological site study (BLM 1991, 1994b). The Gila Box RNCA is a popular recreational spot for both local residents and visitors, drawing an estimated 20,000 people per year (S. Knox, BLM, pers. comm.). The reaches of Bonita Creek that cross the Amado and Curtis properties are included in an 8.1-mi-long segment that has been recommended by the BLM and the Department of the Interior for Wild and Scenic River designation (BLM 1994a). Resources determined to be "outstandingly remarkable" in this segment include fish and wildlife habitat, riparian, water quality, recreational, and cultural resource values.

PD has let grazing leases for both Amado and Curtis properties, which are located within the BLM's Bonita Creek and Johnny Creek Allotments, respectively (PD 1996). The properties are not encumbered by utilities easements, rights-of-way, or residential leases. Phelps Dodge owns the mineral estates for both properties (ibid.). Phelps Dodge also owns one surface water right of approximately 1.0 acre-foot per year (af/yr) from Bonita Creek for stock watering on the Amado property (SWCA 1996c).

The overall visual quality of the Amado and Curtis properties reflects the rugged terrain and the relative lack of human-caused disturbance in upper Bonita Creek. Landscape elements include flowing water, steep canyon walls, and diverse vegetative communities. An aerial inspection conducted in 1995 found that the dirt roads passing through the properties were overgrown with vegetation and appeared to be untraveled (Zenitech 1998b). Other evidence of human activity was limited to a corral on the Amado property that

appeared to be in a state of disuse and an empty stocktank near the northern end of the Curtis property. No buildings, waste containers, illegal dumping, mining, or other indications of development were visible from the air (ibid.). The adjacent public lands in the RNCA are classified as VRM Class II (BLM 1991), a classification that would also apply to the Amado and Curtis properties if they were acquired. The management objective of Class II is to retain the existing character of the landscape. Management activities may be seen but they should not attract the attention of the casual observer. The level of change to the characteristic landscape should be low. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape (BLM 1991, 1994b).

The Amado and Curtis properties are not located within one mile of a federal hazardous materials National Priority List site or an Arizona Water Quality Assurance Revolving Fund (WQARF) site; a zipACIDS site; or a Resource Conservation and Recovery Act (RCRA) transport, storage, or disposal facility. No Emergency Response Notification System (ERNS) sites are located on the property or in the vicinity. No registered Underground Storage Tanks (UST) sites are located on the property or on adjacent properties. No Leaking Underground Storage Tanks (LUST) sites, or open or closed landfills, are located on or within 0.5 mile of the property (Zenitech 1998b).

3.3.1.1.2 Physical Resources. Review of physical resources on the offered lands for this document was limited to geology/mineral potential. No other physical resources, such as air quality or soils, were investigated. The discussion of the water resources of the offered lands is limited to water rights (see Land Use section of each property), and riparian and other biological resources related to water resources (see Biological Resources section of each property).

Erosion-resistant volcanic rocks make up the bluffs and cliffs along Bonita Creek. These rocks, Miocene to Oligocene in age, include silicic (rich in silica) to mafic (rich in iron and magnesium) flows and pyroclastic rocks, as well as some subvolcanic intrusions (Zenitech 1998b). The potential for the occurrence of six kinds of mineral resources on the Amado and Curtis properties was evaluated and is summarized below in Table 3-27.

Table 3-27. Summary of Mineral Potential of the Amado and Curtis Properties

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	B
Non Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	B

Source: D.E. Wahl 1997b

3.3.1.1.3 Biological Resources. A well-developed riparian community exists along the segments of Bonita Creek that flow through the two properties (SWCA 1995b). This community is characterized by an overstory of mature Fremont cottonwood, Goodding willow, sycamore, mesquite, and netleaf hackberry, with an understory of desert broom, seep-willow, coyote willow, burro brush, and an occasional tamarisk or tree tobacco. Wildrye and bermuda grass are found in abundance. Continuous recruitment of trees is occurring,

as indicated by stands and individuals of various ages throughout the canyon. Vegetation within the creek includes watercress and unidentified annual emergent vegetation, but because of frequent scouring, no well-developed community of emergent or aquatic vegetation grows along the stream. In the upstream portions of the properties where the canyon floor broadens, mesquite trees form bosques of several acres in extent. Most of the trees are young to middle-aged, but a few are large, older specimens. Upland vegetation on the canyon walls and ridges above the creek includes typical Sonoran Desertscrub plants such as prickly pear cactus, ocotillo, and catclaw acacia. Large patches of undisturbed native grasses are also present. Much of this upland is very steep and appears to be inaccessible to grazing cattle (SWCA 1995c).

Because perennial water is available in the canyon and little human activity takes place, wildlife is abundant. A large number of bird species were observed during field surveys in February 1995 (SWCA 1995c). The abundance and mix of species seen at that time suggest that Bonita Creek Canyon is important to wintering and migrating species, as well as to the expected summer resident species. Rocky Mountain bighorn sheep were seen during the surveys, and mammal sign observed included that of mule deer, black bear, raccoon, mountain lion, coyote, collared peccary, beaver, and white-throated woodrat. The canyon cliffs include numerous overhangs, small caves, and crevices that may provide roosts for several species of bats.

Of the 29 special interest species identified by federal and state agencies as potentially occurring on the Amado and Curtis properties, 13 are considered likely to occur with some regularity, 11 may occur occasionally, and the remaining five are unlikely to occur (see Table 3-28). One special interest plant species that is likely to occur with some regularity was not identified by AGFD or USFWS: Arizona hedgehog cactus. BLM surveyed the Amado and Curtis properties and other public lands within the Gila Box RNCA for this species and located numerous specimens of a cactus that is morphological similar to this species.

3.3.1.1.4 Cultural Resources. A review of archaeological site records at the Arizona State Museum and the BLM Safford Field Office indicated that some archaeological survey has been conducted along the reach of Bonita Creek that traverses the Curtis and Amado properties (SWCA 1995a). Sites recorded within the property boundaries include two sites dating from the prehistoric Formative period (A.D. 1250-1450) and a few sites dating from the Late Historical period (A.D. 1890-1930). The prehistoric sites are rock shelters (AZ W:14:1 and AZ W:14:4). The second of these, "Ceremonial Cave," contained wooden artifacts thought to serve a ritual function. This site also was used during the Late Historical period, apparently as a homesite. Other recorded historical sites include a homesite containing ruins of a stone building (AZ W:19:9) and two sites with irrigation features (AZ W:14:8 and AZ W:14:11). During a recent field visit to the properties by an archaeologist, most of the recorded sites were judged to be potentially eligible for inclusion in the *National Register of Historic Places*, in part because they are likely to contain information about the settlement-subsistence systems of the canyon's prehistoric and historical inhabitants (SWCA 1995a).

3.3.1.1.5 Socioeconomic Resources. The Amado and Curtis properties, taxed as Vacant Land, generated $22 and $91, respectively, in private property taxes for Graham County in 1996 (PD 1996). Each property generates $105 in annual grazing fees for PD.

3.3.1.2 Musnicki Property

The 640-acre Musnicki property is located in Cochise County on the western edge of the San Simon Valley, at the base of the Dos Cabezas Mountains. Most of the property appears relatively flat, but it slopes very gently uphill toward the south and west before rising abruptly into mountainous terrain along the southern and western borders (Zenitech 1998b). Elevation ranges between 4,000 and 4,400 feet. An ephemeral wash, Ninemile Creek, and a few tributary washes drain to the northeast. A small, apparently perennial pool is located amid boulders near the ranch site. Its source may be Ninemile Spring, located about 0.5 mile south of the property boundary (Zenitech 1998b). The property contains an abandoned ranch house, the former headquarters of the Ninemile Ranch.

Table 3-28. Special Interest Species Potentially Occurring on the Amado and Curtis Properties

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
Arizona hedgehog cactus	*Echinocereus triglochidiatus arizonicus*	E , SS
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Bald eagle	*Haliaeetus leucocephalus*	T, SS, WSCA
Gila chub	*Gila Intermedia*	C, SS, WSCA
Lowland leopard frog	*Rana yavapaiensis*	SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Longfin dace	*Agosia chrysogaster*	SS
Speckled dace	*Rhinicthys osculus*	SS
Sonoran sucker	*Catostomus insignis*	SS
Desert sucker	*Catostomus clarki*	SS
Common black-hawk	*Buteogallus anthracinus*	SS
Belted kingfisher	*Ceryle alcyon*	SS
Fringed myotis	*Myotis thysanodes*	SS
Spotted bat	*Euderma maculata*	SS
Species That May Occur Occasionally		
Razorback sucker	*Xyrauchen texanus*	E, SS, WSCA
Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	E, SS, WSCA
Southwestern willow flycatcher	*Empidonax traillii extimus*	E, SS, WSCA
Yellow-billed cuckoo	*Coccyzus americanus*	SS, WSCA
Western red bat	*Lasiurıs blossevillii*	SS, WSCA
Greater western mastiff bat	*Eumops perotis*	SS, WSCA
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Big free-tailed bat	*Nyctinomops macrotis*	SS
Species Unlikely to Occur		
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Southern yellow bat	*Lasiurıs xanthinus*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

*Status Key: E = Federal Endangered; T = Federal Threatened; C = Federal Candidate; SS = BLM Sensitive Species; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996).
Source: SWCA 1995c.

3.3.1.2.1 Land Use. The Musnicki property boundary totals 4.5 miles, of which 1.75 miles (or 39 percent) adjoin the 11,998-acre Dos Cabezas Mountains Wilderness (SWCA 1996c). The remaining 2.75 miles (or 61 percent) adjoin private lands or BLM-administered land not included in the Wilderness. The Dos Cabezas Mountains Wilderness is managed by the BLM to provide for the long-term protection and preservation of the area's wilderness character. Figure 2-28 shows the property in relation to surrounding land ownership.

The Musnicki property is directly accessible via an unnamed dirt road off Happy Camp Canyon Road. This unimproved road terminates at the Ninemile Ranch near the southern boundary of the property. No public access is currently authorized for this route although it is the only approach to the northeastern corner of the Dos Cabezas Mountains Wilderness from the north (ibid.); a road in Sheep Canyon to the east provides access to the eastern end of the wilderness.

Because this property is privately owned, no recreational uses by the public are authorized. However, potential recreational uses include, but are not limited to, hunting, hiking, camping, picnicking, photography, and bird and wildlife watching (ibid.).

This property is adjacent to the BLM's Ninemile grazing allotment, and PD has let a grazing lease for the property to the holder of the BLM allotment. In addition to the grazing lease, Valley Telephone Cooperative, Inc. has a right-of-way for a buried telephone line on the property that provides service to the residential structure at Ninemile Ranch (S. George, scoping respondent, 1994). Phelps Dodge has let a month-to-month residential lease for the property. No other easements, rights-of-way, or other encumbrances are associated with this property. Phelps Dodge owns the mineral estate (PD 1996). Phelps Dodge also owns one surface water right of 15.0 af/yr from Ninemile Creek for agricultural, domestic, and stock watering use on this property (SWCA 1996c).

No formal visual quality analysis was completed for the Musnicki property; however, natural resource elements of the property that define its visual quality include moderate to heavy upland and riparian vegetation and gently sloping terrain that provides open vistas of the Dos Cabezas Mountains Wilderness and the San Simon Valley. The land to the extreme south and west is bouldery and rises steeply into the Dos Cabezas Mountains. A small area near the southern boundary of the property includes substantial human alterations to the natural environment, including the abandoned Ninemile Ranch residence, storage sheds, a windmill and water tank, a corral, and various ranch and farming equipment (Zenitech 1998b). If acquired, the Musnicki property would be managed by BLM as VRM Class IV, for which the management objective is to provide for management activities that require major modification of the existing character of the landscape. The level of change can be high, but the visual impact of alterations should be minimized through careful location and minimal disturbance and by repeating the basic elements. The adjoining Dos Cabezas Mountains Wilderness is categorized as VRM Class I, for which the objective is to preserve the existing character of the landscape by allowing only very limited management activity. The level of change should be very low and it must not attract attention (Safford District RMP; BLM 1991).

Aerial and ground inspection of the Musnicki property revealed no illegal dumping or evidence of underground storage tanks. Some surface staining, apparently from oil, was observed on the ranch road. Lead-acid batteries and containers of automotive cleaning agents and a cattle feed supplement were observed near the ranchhouse, but they were subsequently removed by the owner. The property is not located within one mile of a federal hazardous materials National Priority List site or an Arizona WQARF site; a zipACIDS site; or an RCRA transport, storage, or disposal facility. No ERNS sites are located on the property or in the vicinity. No registered UST sites are located on the property or on adjacent properties. No LUST sites, or open or closed landfills, are located on or within 0.5 mile of the property (Zenitech 1998b).

3.3.1.2.2 Physical Resources. The geology of the Musnicki property consists of early Miocene-to-Oligocene granitoid rocks, overlying much older Precambrian granitoid and metamorphic rocks. Surface geology includes fine-grained alluvial material derived from these parent rocks, with outcroppings of bedrock forming the transition from the San Simon Valley to the Dos Cabezas Mountains (Zenitech 1998b). The potential for occurrence of mineral resources on this property is summarized in Table 3-29.

Table 3-29. Summary of Mineral Potential of the Musnicki Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	C
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	B

Source: D.E. Wahl 1997b

3.3.1.2.3 Biological Resources. Upland slope vegetation includes mesquite, Palmer agave, wolfberry, desert hackberry, catclaw acacia, white-thorn acacia, prickly pear, turpentine bush, squawbush, ocotillo, beargrass, Coahuila juniper, Emory oak, and scrub oak. The majority of the property is vegetated by small mesquites, which increase in size along the dry washes, and other xeroriparian vegetation consisting of desert broom and desert willow (SWCA 1995c).

Wildlife species or sign observed during a site visit included black bear, gray fox, mule deer, coati, coyote, Harris' antelope squirrel, black-tailed jackrabbit, white-throated woodrat, common raven, cactus wren, canyon wren, rock wren, canyon towhee, northern mockingbird, house finch, verdin, black-throated sparrow, Gambel's quail, phainopepla, greater roadrunner, red-tailed hawk, scrub jay, rattlesnake, and various lizards (SWCA 1995c). The AGFD classified this property as Resource Category IV habitat for wildlife.

Of 18 special interest species identified by federal and state agencies as potentially occurring on the Musnicki property, 3 are considered likely to occur with some regularity, 12 may occur occasionally, and the remaining 3 are unlikely to occur (Table 3-30).

3.3.1.2.4 Cultural Resources. The property has not been systematically surveyed for cultural resources, although several sites have been recorded within a mile of it, and one site may have been recorded within it (SWCA 1995a). Recorded sites to the west and northwest of the property include five rock-shelter sites that, as a group, contain petroglyphs, bedrock mortars, roasting pits, potsherds, flaked-lithic artifacts, and pieces of shell. These sites are located at or near the base of the Dos Cabezas Mountains. Also present are one or two historic-to-recent trash scatters. Immediately northeast of the property is a probable habitation site with surface structures, possible pit houses, and a variety of decorated pottery types that suggest an occupation date between A.D. 650 and 1150. A site recorded by Gila Pueblo as Ninemile Ruin may be located within the property. In addition, several unrecorded sites were observed during a visit to the property (SWCA 1995a). There may be additional sites yet unrecorded on the property.

3.3.1.2.5 Socioeconomic Resources. The Musnicki property is taxed as Agriculture/Ranch land, and PD paid Cochise County $155 in private property taxes for this property in 1996 (PD 1996). The grazing lease for this property generates approximately $100/lease-year to PD.

Table 3-30. Special Interest Species Potentially Occurring on the Musnicki Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Lesser long-nose bat	*Leptonycteris curasoae*	E, SS, WSCA
Wilcox fishhook cactus	*Mammillaria wrightii wilcoxii*	SS,, SR
Huachuca golden aster	*Heterotheca rutteri*	SS
Canyon spotted whiptail	*Cnemidophorus burti*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	SS
Pinaleno hedgehog cactus	*Echinocereus ledingii*	SR
Species Unlikely to Occur		
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

*Status Key: E = Federal Endangered; SS = BLM Special Status; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1995c.

3.3.1.3 Schock Property

The 240-acre Schock property is located at the base of the Mustang Mountains, in the northeastern corner of Santa Cruz County, Arizona. Gently rolling hills rising to mountainous terrain along the eastern border dominate the topography. Elevation ranges from 5,000 to 5,600 feet. Two minor ephemeral washes drain the property (Zenitech 1998b).

3.3.1.3.1 Land Use. This property is a privately owned inholding within the Empire-Cienega RCA, a 45,000-acre Long-Term Management Area administered by the BLM's Tucson Field Office. Long-Term Management Areas are areas in which the BLM would like to maintain its long-term management presence (see Safford District RMP, as amended, Map 27). The Schock property represents approximately 0.5 percent of the total area within the Empire-Cienega RCA. The property has a total boundary of 3.0 miles, of which 0.5 mile abuts state lands. The remaining 2.5 miles abut other private lands (SWCA 1996c). Figure 2-29 shows the location of the Schock property in relation to surrounding land ownership.

This property, which is gated and fenced, is accessible via a county-maintained paved road to Elgin, Arizona, off of State Highway 82. Because the property is privately owned, no public recreational uses are authorized.

However, potential dispersed recreational uses of the property may include, but are not limited to, hiking and bird and wildlife watching (SWCA 1996c).

Other than a grazing lease, no other easements, rights-of-way, or residential leases are attached to the Schock property. Phelps Dodge owns the mineral estate (ibid.). No surface water rights have been filed for this property.

Some natural resource elements which define the property's visual resources include the rolling hills and open grasslands of the surrounding areas and a view of the monument-like volcanic core of Mount Bruce in the nearby Mustang Mountains. No buildings, mines, or other evidence of human development is visible on the property (ibid.). Visual resource management objectives for the surrounding Empire-Cienega RCA are currently being developed by the BLM's Tucson Field Office as part of an overall management plan for the RCA. While the plan is not complete and VRM objectives have not been established, visual resource issues have been discussed by a team of citizens and BLM specialists.

Aerial and ground inspection of the Schock property revealed no illegal dumping, surface staining, unusual odors, discarded waste containers, or indications of underground storage tanks or aboveground storage tanks. No federal hazardous materials National Priority List site; Arizona WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the Schock property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.1.3.2 Physical Resources. The underlying geology of the Schock property consists of surficial deposits of Holocene to middle Pleistocene alluvium. Adjacent mountainous terrain is composed primarily of sedimentary rocks of Permian and Pennsylvanian age (Zenitech 1998b). The potential for occurrence of mineral resources on the Schock property was evaluated and is summarized below in Table 3-31.

Table 3-31. Summary of Mineral Potential of the Schock Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	B
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	B

Source: D.E. Wahl 1997b

3.3.1.3.3 Biological Resources. Vegetation on the property is characteristic of the Semidesert Grassland community. The property appears to have been burned in the recent past, as evidenced by charred stumps of beargrass and has been heavily grazed by cattle and horses. Vegetative cover is dominated by grasses, both native and introduced, including blue grama, black grama, side-oats grama, three awn species, and lovegrass, interspersed with narrow-leafed yuccas, agaves, and beargrass. Shrubs occur in clumps or are widely spaced on the lower portions of the property, and increase in density uphill. Shrub and tree species

observed include catclaw acacia, buckwheat, desert broom, sumac, ocotillo, mortonia, threadleaf groundsel, and fairy duster. Cactus and succulent species present include banana yucca, desert spoon, narrow-laved yucca, shindaggers, prickly pear cactus, cane cholla, Arizona rainbow cactus, beargrass, Palmer agave, and Bisbee beehive cactus. A few mesquite trees are present in the lower portions of the property, and junipers are present at the higher elevations. Limestone outcrops up slope often had several species of ferns growing on them, as well as dense patches of shindaggers and some brilliantly colored patches of lichens (SWCA 1995c).

Wildlife observed during site visits included Gambel's quail, rock wren, chipping sparrow, rufous-winged sparrow, common raven, cactus wren, dark-eyed junco, rufous-sided towhee, canyon towhee, mule deer, American pipit, and horned lark. Although no pronghorn were observed, the AGFD documented them on the property during a 1992-1993 aerial survey (SWCA 1995c).

Of 21 special interest species identified by federal and state agencies as potentially occurring on the Schock property, four are considered likely to occur with some regularity, 13 may occur occasionally, and the remaining four are unlikely to occur (Table 3-32).

3.3.1.3.4 Cultural Resources. The Schock property has not been surveyed for cultural resources, and no sites have been recorded in the vicinity. No cultural materials were observed during field reconnaissance. Archaeological sites—particularly flaked-lithic scatters—may occur on the property. The density of sites of this type, in the kind of setting represented by the Schock property, is anticipated to be relatively low. Nevertheless, the property may contain one or more archaeologically significant sites (SWCA 1995a).

3.3.1.3.5 Socioeconomic Resources. The Schock property, taxed as Agriculture/Ranch land, generated $1,101 in property taxes for Santa Cruz County in 1996. Phelps Dodge currently receives $100/lease-year in grazing fees for the Schock property (PD 1996).

3.3.1.4 Feulner Property

The 320-acre Feulner property is located within Pima County, northwest of the Whetstone Mountains about one mile east of Cienega Creek. Topography in the area consists of sparsely vegetated hills cut by entrenching arroyos draining west into the creek. The property is bisected from the southeast to the northwest by an ephemeral wash. Elevation on the property ranges from 4,100 to 4,400 feet (Zenitech 1998b).

3.3.1.4.1 Land Use. This privately owned property lies within the perimeter of the Empire-Cienega RCA. It represents less than one percent of the total area within that perimeter. The property has a total boundary of 3.0 miles, all of which abuts state lands (SWCA 1996c). Figure 2-30 shows the property and surrounding land ownership.

The Feulner property is accessible via a maintained, gated but unlocked, gravel road off of Interstate 10 eastbound southeast of Tucson. The road provides access for ranchers in the vicinity, and for Arizona Electric Power Cooperative, Tucson Electric Power Company, and Southwest Gas Company to maintain a 115 kV powerline, a 138 kV powerline, and a natural gas pipeline, respectively (SWCA 1996c).

Because the property is privately held, no public recreational uses are authorized. However, because of its location within the Empire-Cienega RCA, potential recreational uses include, but are not limited to, hiking, camping, picnicking, hunting, and bird and wildlife watching. No eligible or recommended river segments occur on the property; however, the property is within the watershed of a portion of Cienega Creek recommended by the BLM and the Department of the Interior for Wild and Scenic River designation (ibid.).

Table 3-32. Special Interest Species Potentially Occurring on the Schock Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Bunchgrass lizard	*Sceloprous scalaris*	SS, WSCA
Desert tortoise	*Gopherus agassiz*	SS, WSCA
Sprague's pipit	*Anthus spragueii*	SS, WSCA
Baird's sparrow	*Ammodramus bairdii*	SS, WSCA
Lesser long-nose bat	*Leptonycteris curasoae*	SS, WSCA
Canyon spotted whiptail	*Cnemidophorus burti*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Button cactus	*Epithelantha micromeris*	SR
Species Unlikely to Occur		
Gila chub	*Gila intermedia*	C, SS, WSCA
Chiricahua Leopard Frog	*Rana chiricahuensis*	C, SS, WSCA
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS

* Status Key: E = Federal Endangered; C = Federal Candidate; SS = BLM Sensitive Species; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1995c.

Currently PD has let a grazing lease for the property, but no easements, rights-of-way, residential leases, or other encumbrances have been negotiated for this property. Phelps Dodge owns the mineral estate (PD 1996). One surface water right belonging to Empirita Ranch Corporation for 3.0 af/yr from Upper Coyote Spring has been filed for stock watering use on the property.

No formal visual quality analysis has been completed for the Feulner property; however, some natural resource elements of the area that define its visual quality include native grassland and woodland vegetation, and surrounding rolling hills (SWCA 1996c). No buildings, mines, or other indications of development are visible on the property (Zenitech 1998b). Visual resource management objectives for the surrounding Empire-Cienega RCA are currently being developed by the BLM's Tucson Field Office as part of an overall management plan for the RCA. While the plan is not complete and VRM objectives have not been established, visual resource issues have been discussed by a team of citizens and BLM specialists.

An aerial inspection of the Feulner property revealed no buildings, waste containers, illegal dumping, mining, or other indications of development. No federal hazardous materials National Priority List site; Arizona

WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.1.4.2 Physical Resources. The Feulner property consists of older surficial deposits of middle Pleistocene to late Pliocene alluvium. The subsurface geology consists of sedimentary rocks of Permian and Pennsylvanian age that has minimal surface exposure (Zenitech 1998b). The potential for occurrence of mineral resources on the Feulner property was evaluated and is summarized in Table 3-33.

Table 3-33. Summary of Mineral Potential of the Feulner Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	B
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	B

Source: D.E. Wahl 1997b

3.3.1.4.3 Biological Resources. The Feulner property contains elements of both the Semidesert Grassland and the Arizona Upland Subdivision vegetative communities of the Sonoran Desertscrub biome. The wash's riparian vegetation is dominated by white-thorn acacia, mesquite, netleaf hackberry, desert broom, desert sumac, and rubber rabbitbrush. Common shrubs in the uplands include fairy-duster, white-thorn acacia, catclaw acacia, banana yucca, desert spoon, creosote bush, ocotillo, mortonia, Mexican crucillo, shindaggers, and Palmer agave. Cacti observed on the property include prickly pear, Fendler hedgehog cactus, Arizona rainbow cactus, needle-spined pineapple cactus, Bisbee beehive cactus, barrel cactus, cane cholla, and desert Christmas cactus. At least 10 needle-spined pineapple cacti, formerly a federal Category 2 candidate species, were observed on the property. Grasses commonly observed included Arizona cottontop, green sprangletop, spidergrass, three-awns, cane beardgrass, side-oats grama, Lehman lovegrass, and slim tridens (SWCA 1995c).

Habitats on this property are considered by the AGFD to be Resource Category III (medium to high resource value for Arizona wildlife species and considered relatively abundant on a statewide basis). Wildlife is expected to be typical of the habitats represented on the property (SWCA 1995c).

Of 20 special interest species identified by federal and state agencies as potentially occurring on the Feulner property, four are considered likely to occur with some regularity, 11 may occur occasionally, and the remaining five are unlikely to occur (Table 3-34).

Table 3-34. Special Interest Species Potentially Occurring on the Feulner Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Lesser long-nosed bat	*Leptonycteris curasoae*	E, SS, WSCA
Bunchgrass lizard	*Sceloprous scalaris*	SS , WSCA
Desert tortoise	*Gopherus agassiz*	SS, WSCA
San Carlos wild-buckwheat	*Eriogonum capillare*	SS, SR
Canyon spotted whiptail	*Cnemidophorus burti*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Species Unlikely to Occur		
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	E, SS, WSCA
Gila chub	*Gila intermedia*	C, SS, WSCA
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

*Status Key: E = Federal Endangered; C = Federal Candidate; SS = BLM Sensitive Species; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1995c.

3.3.1.4.4 Cultural Resources. The property has not been surveyed for cultural resources, and no sites have been recorded there. However, an unrecorded rock feature and several isolated flaked-lithic artifacts were noted during a reconnaissance of the property (SWCA 1995a). These included several cores and one flake observed on the benches and low hills that flank the primary drainage. The benches are covered by a dense growth of white-thorn acacia, making observation difficult, and it is likely that more artifacts are present than were seen during reconnaissance. The presence of the rock feature and artifacts suggests that additional, archaeologically significant sites are probably present on the Feulner property.

3.3.1.4.5 Socioeconomic Resources. The Feulner property is taxed as Agricultural/Ranch land and generated $74 in property taxes for Pima County in 1996. Phelps Dodge receives $150 annually in grazing fees for this property (PD 1996).

3.3.2 Optional Package

The optional package of offered lands consists of the following PD-owned properties: Tavasci Marsh, Freeland, Butler-Borg, Norton, Clyne I, and Clyne II. The Tavasci Marsh property borders the National Park Service-administered Tuzigoot National Monument in Yavapai County; the Freeland and Butler-Borg properties are clustered with the Musnicki property adjacent to the Dos Cabezas Mountains Wilderness in Cochise County; and the Clyne I and Clyne II properties, located in Pima County, lie within the Empire-Cienega RCA, as do the Schock and Feulner properties.

3.3.2.1 Tavasci Marsh Property

This property is located approximately 2.0 miles east of the community of Clarkdale in Yavapai County, Arizona, near the Verde River. The 323-acre property is composed mostly of undeveloped, flat marshland and the overlooking bluffs. Elevation ranges from 3,300 to 3,800 feet (Zenitech 1998b).

3.3.2.1.1 Land Use. The Tavasci Marsh property, which was acquired by PD in 1929, encompasses the Tavasci Marsh Habitat Restoration Project, a spring-fed, naturally occurring wetland currently managed by the AGFD per a cooperative agreement with PD. Tuzigoot National Monument, which is managed by the National Park Service, borders on the west,[19] as does privately owned property. National forest lands managed by the U.S. Forest Service adjoin the property on the east and north. The Verde River Greenway, a six-mile reach of the Verde River managed by Arizona State Parks, and Dead Horse Ranch State Park adjoin the property on the south. Figure 2-31 shows the property in relation to surrounding land ownership.

AGFD's management objectives for the Tavasci Marsh Habitat Restoration Project are to restore and preserve wetland habitat for wildlife, including threatened and endangered species, and to provide educational and recreational opportunities in the marsh that are compatible with its sensitive nature (Phelps Dodge Development Corporation 1990). Recreational facilities include a hiking trail that leads through the marsh to an observation platform for wildlife and bird watching. Informational signs have been posted around the property. No camping or hunting is allowed on the property.

Tuzigoot National Monument was created to preserve Tuzigoot Ruin, the remnant of a prehistoric Sinaguan Indian pueblo. National Park Service management objectives for the Monument include making the site available to the public and providing interpretive information. The Verde River Greenway is managed to conserve natural resources, preserve cultural resources, and develop recreational opportunities. Tavasci Marsh is located within the 500-year floodplain of the Greenway.

The privately owned property to the west of Tavasci Marsh contains 98-acre Peck's Lake; a nine-hole golf course built in 1925; and the 120-acre, inactive Clarkdale tailings pile (Zenitech 1998b). Land use for several decades has been solely recreational; however, plans are underway to develop the property for a 977-acre residential community (Verde Valley Ranch) with 950 housing units; a new, 18-hole golf course; ancillary commercial and retail space; and open space. Development plans call for capping the tailings pile and building the new golf course on part of the reclaimed surface. The remaining surface will be planted with native vegetation and maintained as open space. Boundary walls without gates will be constructed around

[19] The Tavasci Marsh property borders Tuzigoot National Monument but lies within a much larger area defined by the congressionally approved "boundary" of the monument. This boundary does not signify land ownership—it encompasses private and state lands as well as the monument itself—rather it defines an area that Congress believed should comprise an enlarged monument. The National Park Service is authorized to acquire available non-federal land within the approved boundary through purchase, donation, or exchange for inclusion in the monument.

portions of the development to limit access by residents and their pets to Tavasci Marsh and other neighboring lands (SWCA 1993).

The Tavasci Marsh property is accessible via four routes: 1) a gravel road between Peck's Lake and Dead Horse Ranch State Park; 2) a primitive hiking trail along the north bank of the Verde River; 3) a gravel road that approaches the property from the southeast; and 4) a gravel road from Tuzigoot National Monument, which is usable only by special permit from the National Park Service (SWCA 1996c). Wildlife and bird watching are important recreational activities on this property. Hiking opportunities are available as well.

A grazing lease excluding the Tavasci Marsh Habitat Restoration Project has been let for this property. No residential leases, rights-of-way, or other encumbrances are associated with the property. Telephone cables run through portions the property, both above and below ground. Phelps Dodge owns the mineral estate. Phelps Dodge also owns water rights for 806.5 af/yr from Shea Spring for stock watering and wildlife uses. Shea Spring is the principal spring feeding Tavasci Marsh.

No formal visual quality analysis was completed; however, some natural resource elements of the Tavasci Marsh property which define its visual quality include lush, green marsh; riparian vegetation; open water; and limestone river terraces that form steep bluffs overlooking the marsh (SWCA 1996c). Wooden structures from a historical dairy stand west of the marsh. No other indications of development are evident on the property (Zenitech 1998b). The view to the north and east is dominated by red and gray mesas. Tuzigoot Ruin is visible atop a ridge on the southwestern side of the property, and the historic mining town of Jerome can be seen on a distant mountainside to the west. From certain vantage points on the property, the Verde River and the Verde Valley are visible at the base of the Mogollon Rim to the southeast.

Site inspection of the Tavasci Marsh property revealed no indications of dumping of solid or hazardous waste, soil staining, chemical storage containers, or chemical odors. No federal hazardous materials National Priority List site; Arizona WQARF site; or RCRA transport, storage, or disposal facility is located within one mile of this property. One former WQARF site, the Bitter Creek Phelps Dodge Verde Mine site, does fall within a one-mile perimeter of the property, but state investigation of that site closed as of June 28, 1995. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

One zipACIDS site, the Phelps Dodge Verde Tailing site (Clarkdale tailings pile),[20] is located about 0.7 mile from the Tavasci Marsh property on the land being developed as Verde Valley Ranch. The majority of stormwater runoff from that land drains into Peck's Lake, which then discharges to Tavasci Marsh, and a smaller amount drains directly into the marsh. To determine if the tailings have been releasing metals into Tavasci Marsh, samples of surface water and sediment from several locations in the marsh were analyzed in 1993 and re-evaluated in 1997. The level of arsenic in one water sample exceeded Federal Maximum Contaminant Levels under the Safe Drinking Act. The level of arsenic in multiple sediment samples exceeded Arizona Human Health Based Guidance Levels and EPA Region IX Preliminary Remediation Goals (PRGs) for soil screening levels for migration to groundwater. Levels of chromium from all sediment samples exceeded EPA Region IX PRGs. The test findings, however, do not necessarily indicate contamination from the tailings pile. Elevated concentrations of arsenic found in surface waters and groundwaters throughout the Verde Valley have been attributed to natural leaching from the underlying Verde Formation (Baker et al. 1993). An ADEQ remediation program (APP No. P-101076) for the Clarkdale tailings pile, now underway, calls for capping the tailings and associated ponds, installing a slurry wall between the pile and Peck's Lake, developing a groundwater pumpback system, and building a new

[20] This site is listed in the Arizona CERCLA Information and Data System (zipACIDS) as zipACIDS No. 1053, EPA ID No. AZD983475773. Listing means the location is under investigation for possible contamination of soil, surface water, or groundwater.

wastewater treatment facility. Completion of this program is expected to result in a closed zipACIDS listing for this site. No remedial action beyond the APP permit requirements is being required for any contaminants in Tavasci Marsh (Zenitech 1998b).

Development of Verde Valley Ranch will change the pollutant loads of runoff into Peck's Lake and Tavasci Marsh. Total suspended solids, biological oxygen demand, total lead, and total copper are expected to decrease. Chemical oxygen demand, potassium, total zinc, total nitrogen, total phosphorus, and oil and grease are expected to increase. These changes reflect the difference between pollutants from native soils and pollutants from urban development. Under the Stormwater Pollution Prevention Plan required for the Verde Valley Ranch, the projected pollutant loads would not exceed ADEQ Surface Water Quality Standards (SWCA 1996h).

3.3.2.1.2 Physical Resources. The Tavasci Marsh property is located in part of an abandoned oxbow of the Verde River on portions of the Verde River floodplain and alluvial terraces. The terrain is composed of recent Holocene sand and gravel fluvial deposits within the old riverbed, with Pliocene-to-middle Miocene sediments comprising the floodplain and terraces. These are capped in areas by Quaternary surficial deposits (Zenitech 1997). The potential for the occurrence of six groups of mineral resources on the Tavasci Marsh property is summarized in Table 3-35. For an explanation of the Mineral Potential Classification System as used in this table see Section 3.2.2.3.2 of this document.

Table 3-35. Summary of Mineral Potential of the Tavasci Marsh Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	C
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Moderate	B

Source: D.E. Wahl 1997b

3.3.2.1.3 Biological Resources. Vegetation on the site has been categorized as belonging to five different vegetation associations and one disturbed habitat, all of which intergrade with each other (SWCA 1996d). These vegetation associations are as follows:

- Sonoran Interior Marshland, *Typha domingensis* Association, with a variety of other wetland plants (bulrush, sedges, spikerushes, and willow) mixed in with the cattails and including areas of open water, with submergent and floating plants;
- Cottonwood-Willow Association (Fremont cottonwood-Goodding willow);
- Mesquite-Hackberry Association;
- Sonoran Riparian Woodland;

- Crucifixion Thorn-Juniper-Creosotebush Association on the limestone terrace above the marsh; and
- Disturbed areas impacted by drainage, grazing, or other human activities, but that are recovering to become marshland, mesquite or cottonwood-willow woodland.

Tavasci Marsh is a popular place for bird watching. More than 110 species of birds have been recorded from the marsh, including several species of marsh-dependent birds and riparian-obligate birds likely to nest or summer there. Species dependent upon the marsh and associated riparian woodland habitats that were observed during reconnaissance of the property in 1996 included yellow-billed cuckoo, great blue heron, black-crowned night heron, northern harrier, white-faced ibis, yellow warbler, yellow-breasted chat, pied-billed grebe, mallard, green-winged teal, sora, common moorhen, American coot, common yellowthroat, red-winged blackbird, lesser goldfinch, and song sparrow (SWCA 1996d). Also seen were birds that frequent the adjacent upland communities or roost in trees at the edge of the marsh including red-tailed hawk, Cooper's hawk, barn owl, great horned owl, cactus wren, Bewick's wren, rock wren, northern rough-winged swallow, turkey vulture, Gambel's quail, mourning dove, white-winged dove, greater roadrunner, black-chinned hummingbird, Gila woodpecker, ladder-backed woodpecker, black phoebe, Say's phoebe, ash-throated flycatcher, western kingbird, vermillion flycatcher, verdin, northern mockingbird, Bell's vireo, summer tanager, western tanager, northern cardinal, blue grosbeak, canyon towhee, Abert's towhee, rufous-crowned sparrow, black-throated sparrow, great-tailed grackle, house finch, and brown-headed cowbird. The endangered southwestern willow flycatcher is known to nest at Tavasci Marsh and along the Verde River near the property, and bald eagles and peregrine falcons are known to forage in the vicinity. Recently, the call of the endangered Yuma clapper rail has been heard in the Marsh. AGFD rates this property as Resource Category I habitat.

Of 19 special interest species identified by the USFWS and the AGFD as potentially occurring on the Tavasci Marsh property, eight are considered likely to occur with some regularity and ten may occur occasionally (Table 3-36). One, the Yuma clapper rail, is known to occur on the property, but due to its recent discovery there, no rate of its potential occurrence is provided in Table 3-36. Because this property would be administered by the NPS rather than the BLM under the proposed land exchange, BLM Sensitive Species are not listed for this property.

The portion of the Verde River and its 100-year floodplain adjacent to the property is designated critical habitat for the razorback sucker. Areas within the 100-year floodplain where thickets of riparian trees and shrubs occur or may become established as a result of natural floodplain processes or rehabilitation are designated critical habitat for the southwestern willow flycatcher.

The Verde Valley Ranch development planned for adjacent land is not expected to adversely affect any listed or proposed species or result in adverse modification of designated or proposed critical habitat in Tavasci Marsh or elsewhere SWCA 1996h).

3.3.2.1.4 Cultural Resources. The Tavasci Marsh property contains multiple archaeological sites, both prehistoric and historic, that are eligible to the *National Register of Historic Places*. Although the property was surveyed in 1986, a recent visit suggests that additional archaeological sites can be located and characterized (SWCA 1996a).

The cultural history of the Tavasci Marsh area is fairly well known because of research at Tuzigoot National Monument. Hohokam farmers colonized the valley by A.D. 800, but by A.D. 1125 were displaced by the Sinagua. Tuzigoot Pueblo was started just before A.D. 1000 and was occupied until about A.D. 1425. By the time the Spanish first explored the Verde Valley, the Yavapai and the Tonto Apache had settled in the

Table 3-36. Special Interest Species Potentially Occurring on the Tavasci Marsh Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, WSCA
Southwestern willow flycatcher	*Empidonax traillii extimus*	E, WSCA
Bald eagle	*Haliaeetus leucocephalus*	T, WSCA
Lowland leopard frog	*Rana yavapaiensis*	WSCA
Mexican garter snake	*Thamnophis eques*	WSCA
Yellow-billed cuckoo	*Coccyzus americanus*	WSCA
Least bittern	*Ixobrychus exilis*	WSCA
American bittern	*Botaurus lentiginosus*	WSCA
Species That May Occur Occasionally		
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	E, WSCA
Razorback sucker	*Xyrauchen texanus*	E, WSCA
Arizona cliff rose	*Purshia subintegra*	E, HS
Page springsnail	*Pyrgulopsis morrisoni*	C, WSCA
Roundtail chub	*Gila robusta*	WSCA
Ferruginous hawk	*Buteo regalis*	WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	WSCA
Western red bat	*Lasiurus blossevillii*	WSCA
Ripley wild-buckwheat	*Eriogonum ripleyi*	SR
Verde Valley sage	*Salvia Dorrii Mearnsii*	SR
Species for Which Rate of Occurrence is Unknown		
Yuma Clapper Rail	*Rallus jamaicensis coturniculus*	E, WSCA

* Status Key: E = Federal Endangered; T = Federal Threatened; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1996d.

area. By the 1860s, Euroamericans began settling the valley, and within a decade the Native American population had been pushed out. In the 1880s, the copper boom at Jerome heralded the start of the intensive settlement of the valley (SWCA 1996a).

3.3.2.1.5 Socioeconomic Resources. In 1996, this property, taxed as Vacant Land, generated property taxes of $4,640 for Yavapai County. The existing grazing lease associated with portions of this property generates $300 per month for PD (PD 1996).

3.3.2.2 Freeland Property

This property consists of three physically separate parcels (identified as the West, North, and East parcels in Figure 2-32) totaling 320 acres in the eastern foothills of the Dos Cabezas Mountains in Cochise County, Arizona. The West parcel is located in the mouth of Happy Camp Canyon roughly 1.5-1.75 miles west of the other two parcels. Elevations on this parcel range from 4,480 to 4,640 feet. The East and North parcels, about 0.6 mile apart, lie outside the mouth of the Canyon on the alluvial fan that forms the upper slope of the San Simon Valley. Elevations on the East parcel, which includes a rocky ridge, range from less than

4,100 to about 4,240 feet. Elevations on the gently sloping North parcel range only from 4,100 to 4,180 feet. Happy Camp Wash, which runs through the West parcel, is the major drainage in the area. The three parcels are sufficiently similar in most characteristics to be discussed as one property, except when a specific resource occurs on only one or two of the parcels. In such cases, the parcels on which the resources occur are identified individually.

3.3.2.2.1 Land Use. All three Freeland parcels are located within the Dos Cabezas Long-Term Management Area in the Safford Field Office (BLM 1991). The West Parcel is nearly surrounded by the Dos Cabezas Mountains Wilderness but does not adjoin the Wilderness at any point. Other privately owned properties, including the Butler-Borg property and lands offered for exchange in other proposed actions, intervene. The East and North parcels are within 0.25 and 0.5 mile of the Wilderness, respectively. The Dos Cabezas Mountains Wilderness is managed to provide for the long-term protection and preservation of the area's wilderness character. Within that context, the BLM manages a variety of resource values, including wildlife habitat, vegetation, visual resources, cultural resources, dispersed recreation, and livestock grazing (SWCA 1996c). Figure 2-32 shows the parcels in relation to surrounding land ownership.

Primary access to the parcels is via Happy Camp Canyon Road off Apache Pass Road leading south out of the community of Bowie. This dirt road, a two-wheel-drive road as far as the Indian Bread Rocks Picnic Area and a four-wheel-drive road beyond, follows alongside Happy Camp Wash through West parcel. It provides one of two access points to the northern and central portions of the Dos Cabezas Mountains Wilderness. Short spur roads lead toward the North and East parcels. No other roads or trails are evident (SWCA 1996c).

Because these parcels are privately owned, no public recreational uses are authorized. As these parcels provide access to the central portion of the Dos Cabezas Mountains Wilderness, potential recreational uses of the parcels include, but are not limited to, hunting, hiking, camping, picnicking, and bird and wildlife watching (ibid.). Vehicle use would be permitted on the property but restricted to existing roads and trails.

The Freeland property is adjacent to or part of the BLM's Happy Camp grazing allotment. Currently PD has let a grazing lease and associated road easement to this land (PD 1996). The property is partially fenced for livestock control, and water is available for livestock. No utilities easements, residential leases, rights-of-way, or other legal agreements encumber these parcels. Phelps Dodge owns the mineral estate (ibid.). No surface water rights have been filed for this property.

No formal visual quality analysis was completed for the Freeland property; however, some natural resource elements of the parcels that define visual quality include distinct upland and xeroriparian vegetation, rock outcrops, the large arroyo of Happy Camp Wash, and silhouettes of the surrounding rolling hills. North Parcel affords a long view of the San Simon Valley and Peloncillo Mountains (SWCA 1996c). Human modifications are limited to a functioning windmill and adjacent large, rusted, metal water tank in the West parcel (Zenitech 1998b). If acquired by the BLM, the North and East Parcels would fall within VRM Class IV, and the West Parcel would fall within VRM Class III. The management objective of Class IV is to provide for management activities that require major modification of the existing character of the landscape. The level of change can be high, but the visual impact of alterations should be minimized through careful location and minimal disturbance and by repeating the basic elements. The objective of Class III is to *partially retain* the existing character of the landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. The nearby Dos Cabezas Mountains Wilderness is categorized as VRM Class I, in which the objective is to preserve the existing character of the landscape by allowing only very limited management activity. The level of change should be very low and it must not attract attention.

No federal hazardous materials National Priority List site; Arizona WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the Freeland property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.2.2.2 Physical Resources. The underlying surficial geology of the Freeland property consists of early Miocene to Oligocene granitoid rocks, overlying middle Proterozoic granitoid and metamorphic rocks (Zenitech 1997). Relatively coarse-grained colluvial and alluvial material derived from these parent rocks form the alluvial fan. The potential for occurrence of mineral resources on this property is summarized in Table 3-37.

Table 3-37. Summary of Mineral Potential of the Freeland Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Metallic Minerals	Low	C
Non Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Moderate	B

Source: D.E. Wahl 1997b

3.3.2.2.3 Biological Resources. Vegetation on the flatter terrain of the West and East parcels includes mesquite, catclaw acacia, and burro brush, which combine to form a sparse xeroriparian association. Other prominent species include velvet ash, netleaf hackberry, Emory oak, and gray oak trees and mesquite, catclaw acacia, wolfberry, seep-willow, and burro brush shrubs. Vegetation in the upland portions of the West parcels is intermediate between Interior Chaparral and Sonoran Desertscrub, and includes mesquite, prickly pear, Palmer agave, catclaw acacia, turpentine-bush, fairyduster, sotol, and juniper. The rocky ridge extending onto the East parcel has vegetation intermediate between Interior Chaparral and Sonoran Desertscrub, including sotol, Palmer agave, ferns of several species, scrub oak, squaw bush, side-oats grama grass, and bullgrass. Vegetation on the open North parcel is a relatively homogeneous mixture of shrubby mesquite, catclaw acacia, snakeweed, and various grasses (SWCA 1996d).

Wildlife species observed on the Freeland property include mule deer, canyon towhee, Scott's oriole, house finch, cactus wren, black-throated sparrow, desert cottontail, black-tailed rattlesnake, eastern fence lizard, desert spiny lizard, ladder-backed woodpecker, greater roadrunner, cactus wren, northern cardinal, and Gambel's quail. On the West parcel, the windmill provides water for wildlife as well as livestock, and numerous large rocks with crevices and overhangs provide shelter (SWCA 1996d).

Of 18 special interest species identified by federal and state agencies as potentially occurring on the Freeland property, three are considered likely to occur with some regularity, 12 may occur occasionally, and the remaining three are unlikely to occur (Table 3-38).

Table 3-38. Special Interest Species Potentially Occurring on the Freeland Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Lesser long-nose bat	*Leptonycteris curasoae*	E, SS, WSCA
Huachuca golden aster	*Heterotheca rutteri*	SS
Canyon spotted whiptail	*Cnemidophorus burti*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	SS
Pinaleno hedgehog cactus	*Echinocereus ledingii*	SR
Wilcox fishhook cactus	*Mammillaria wrightii wilcoxii*	SR
Species Unlikely to Occur		
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

* Status Key: E = Federal Endangered; SS = BLM Special Staus; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1996d.

3.3.2.2.4 Cultural Resources.

- **West Parcel.** Based on a check of ASM files, no systematic surveys have been done on or within 1.0 mile of the West parcel, but two sites have been recorded within 1.0 mile of the parcel boundary. AZ CC:14:18 (ASM) consists of petroglyphs and pictographs on five panels in the local granite outcrops. Also present are bedrock mortars, metate fragments, and flaked stone. The second site, AZ CC:14:21 (ASM), is a rock shelter with a spring, pictographs, two bedrock mortars, a mano fragment, and flaked stone. The age and affiliation of the sites could not be determined. Both site cards indicate that additional small sites are in the area; however, a recent, brief inspection of the parcel failed to locate any archaeological sites (SWCA 1996a).

- **East and North Parcels.** Two systematic surveys have been completed within 1.0 mile of these parcels: one in 1982 (Powers Elevation 1982) and the other in 1981 and 1994 (Bromley 1981; Woodall 1994). Between these two surveys and miscellaneous studies, nine prehistoric sites and one historical site have been recorded within 1.0 mile of the parcels. The prehistoric sites include the two rock art sites described above; two additional rock art sites; two lithic scatters (each comprising several hundred artifacts); two sites containing lithic artifacts, sherds, and rock alignments; and one containing a roasting pit, rock shelters, bedrock mortars, rock alignments, lithic

artifacts, sherds, and Euroamerican trash dating from the early 1900s. Salado polychrome sherds found at two of the sites suggest that those locations were occupied between A.D. 1300 and 1450. The historical site consisted of traces of a wooden building and Euroamerican trash dating from the early 1900s. Woodall (1994, p.3) remarks that "Several historic roads, which include the Fort Grant-Fort Bowie Road and the Pueblo Viejo-Fort Bowie Road" are present in this area, but that survey was unable to locate the roads on the ground; such long-abandoned roads may need to be documented with the help of remote sensing imagery (SWCA 1996a).

During a recent field visit, three isolated lithic artifacts were found on the North parcel and three historical sites and a hand-dug well were found on the East parcel. The historical remains are probably parts of a single large ranch complex that appears to be eligible for the *National Register of Historic Places*. The archaeological potential of the East parcel appears to be high, and the other two parcels are likely to include additional sites as well (SWCA 1996a).

3.3.2.2.5 Socioeconomic Resources. The Freeland property is taxed as Vacant Land and generated $292 in property taxes for Cochise County in 1996. The current grazing lease generates about $100/lease-year for PD (PD 1996).

3.3.2.3 Butler-Borg Property

This property consists of 308 acres in lower Happy Camp Canyon at the eastern edge of the Dos Cabezas Mountains in Cochise County, Arizona. It lies about 0.1 mile west of the Freeland West parcel. Straddling Happy Camp Wash, the Butler-Borg property covers the canyon bottom and portions of the rocky, granite slopes on either side. Elevation ranges from 4.500 to 5,400 feet. Curtis Spring is located just east of the property.

3.3.2.3.1 Land Use. The Butler-Borg property borders the 11,998-acre Dos Cabezas Mountains Wilderness, which lies to the north, south, and west. It is also within the perimeter of a designated Long-Term Management Area in the Safford Field Office (Safford District RMP 1991). The boundary of the property totals 3.0 miles, of which 2.0 miles (67 percent) adjoins the Wilderness. The remaining 1.0 mile (or 33 percent) adjoins other private lands that are proposed for BLM acquisition in another land exchange (SWCA 1996c). Figure 2-32 shows the property in relation to surrounding land ownership.

This property is accessible via the Happy Camp Canyon Road, a partly two-wheel-drive, partly four-wheel-drive dirt road off Apache Pass Road leading south out of the town of Bowie, Cochise County, Arizona. This road, which parallels Happy Camp Wash through the property, provides one of two access routes to the northern and central portions of the Dos Cabezas Mountains Wilderness. The road is washed out by Happy Camp Wash immediately east of the property, but continues as a passable dirt road/trail after the washout (SWCA 1996c).

Because the property is privately owned, no recreational uses are authorized. As this property provides access to the central portions of the Dos Cabezas Mountains Wilderness, potential recreational uses of the property include, but are not limited to, hunting, hiking, camping, picnicking, and bird and wildlife watching. Vehicular use would be permitted but restricted to roads and trails. The property does not include, affect, or lie in the watershed of any river segments proposed for Wild and Scenic River designation (ibid.).

The Butler-Borg property is adjacent to the BLM's Happy Camp grazing allotment. Currently PD leases the property for grazing purposes only; the lessee is not permitted to encumber the lease without PD's consent (PD 1996). The property is at least partially fenced for livestock control, and water is available for livestock. No utilities easements, residential leases, rights-of-way, or other encumbrances are associated with this

property. Phelps Dodge owns the mineral estate (ibid.). No surface water rights have been filed for this property.

No formal visual quality analysis was completed for this property; however, natural resource elements that define its visual quality include distinct upland and xeroriparian vegetation, rock outcrops, the large arroyo of Happy Camp Wash, and silhouettes of the surrounding rolling hills (SWCA 1996c). According to the Safford District RMP (BLM 1991), public lands in the area (other than the Dos Cabezas Mountains Wilderness) have been categorized as VRM Class III. If acquired by the BLM, the Butler-Borg property would fall within this classification as well. The objective of Class III is to *partially retain* the existing character of the landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. The adjoining Wilderness is categorized as VRM Class I, in which the objective is to preserve the existing character of the landscape by allowing only very limited management activity. The level of change should be very low and it must not attract attention.

No federal hazardous materials National Priority List site; Arizona WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the Butler-Borg property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.2.3.2 Physical Resources. The underlying surficial geology of the Butler-Borg tract consists of early Miocene to Oligocene granitoid rocks, overlying middle Proterozoic granitoid and metamorphic rocks (Zenitech 1998b). The potential for occurrence of mineral resources on this property is summarized in Table 3-39.

Table 3-39. Summary of Mineral Potential of the Butler-Borg Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Metallic Minerals	Low	B
Non Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Moderate	B

Source: D.E. Wahl 1997b

3.3.2.3.3 Biological Resources. Vegetation on the Butler-Borg property is clearly divided into distinctive xeroriparian and upland communities, with most of the property being upland. Xeroriparian vegetation includes sycamore, Arizona walnut, netleaf hackberry, Arizona cottontop, canyon grape, desert willow, desert broom, velvet ash, mesquite, and catclaw acacia. Upland vegetation is intermediate between the Sonoran Desertscrub community and the Interior Chaparral plant community, containing species characteristic of both. These species include mesquite, catclaw acacia, beargrass, ocotillo, manzanita, sotol, fairyduster, lovegrass, snakeweed, barrel cactus, prickly pear, hedgehog cactus, cane cholla, Palmer agave, wolfberry, banana yucca, squaw bush, Lehmann lovegrass, sumac, scrub oak, Emory oak, and juniper. Juniper

becomes abundant toward the top of the north-facing slope, which may be considered a *Juniperus coahuilensis* Association. The most abundant species in both associations, and the dominant plant on the property, is mesquite, which appears there in the form of a shrub generally less than six feet tall (SWCA 1996d).

Wildlife species or sign observed during a recent site visit included mule deer, coyote, Harris' antelope squirrel, desert cottontail, pocket gopher, white-throated woodrat, cactus wren, turkey vulture, rock wren, canyon towhee, northern mockingbird, house finch, black-throated sparrow, Gambel's quail, and Scott's oriole, and diamondback rattlesnake (SWCA 1996d).

Of 18 special interest species identified by federal and state agencies as potentially occurring on the Butler-Borg property, three are considered likely to occur with some regularity, 12 may occur occasionally, and the remaining three are unlikely to occur (Table 3-40).

Table 3-40. Special Interest Species Potentially Occurring on the Butler-Borg Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Lesser long-nose bat	*Leptonycteris curasoae*	E, SS, WSCA
Wilcox fishhook cactus	*Mammillaria wrightii wilcoxii*	SS, SR
Huachuca golden aster	*Heterotheca rutteri*	SS
Canyon spotted whiptail	*Cnemidophorus burti*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	SS
Pinaleno hedgehog cactus	*Echinocereus ledingii*	SR
Species Unlikely to Occur		
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

*Status Key: E = Federal Endangered; SS = BLM Special Staus; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1996d.

3.3.2.3.4 Cultural Resources. Based on a check of ASM files check, no systematic surveys are known to have been conducted on or within 1.0 mile of the Butler-Borg property. The one site recorded within 1.0 mile of the parcel, AZ CC:14:18 (ASM), is a rock art site previously described in the section on the Freeland property. Based on a limited field reconnaissance of the Butler-Borg property (SWCA 1996a), at least one archaeological site (a historical ranching site) occurs there. This site appears to be eligible for the *National Register of Historic Places*. The presence of AZ CC:14:18 (ASM) near the parcel, in a physical setting that characterizes much of the property suggests that Native American rock art may be present on the property as well. The location of the property in a major canyon of the Dos Cabezas Mountains, within a short distance of a spring, further increases the likelihood of important archaeological sites on this property (SWCA 1996a).

3.3.2.3.5 Socioeconomic Resources. The Butler-Borg property, taxed as Vacant Land, generated $633 in property taxes for Cochise County in 1996. Currently, the grazing lease on this property generates $100/lease-year for PD (PD 1996).

3.3.2.4 Norton Property

Totaling 391 acres, the Norton property consists of two separate parcels located less than 0.75 mile from each other on Black Rock Wash in Graham County, Arizona. Elevations on the property, which encompasses portions of the wash and its sparsely vegetated floodplain, range from 3,000 to 3,100 feet. Black Rock Wash is an ephemeral tributary of the Gila River, draining eastward from the Santa Teresa Mountains.

3.3.2.4.1 Land Use. This property, which has a total boundary of about 5.0 miles, is surrounded entirely by public lands administered by the BLM. The western-most property boundary lies about 0.25 mile east of the San Carlos Apache Reservation. Figure 2-33 shows the location of the Norton property in relation to surrounding land ownership.

The property is accessible from the east via an unpaved portion of the Black Rock Wash Road off of Highway 70. Access from the west via unimproved roads leading from the San Carlos Apache Reservation is restricted because that part of the reservation is closed to nontribal members. The Norton property is privately owned and no recreational activities are authorized; however, evidence of off-road vehicle use is apparent. Potential dispersed recreational uses of the property include, but are not limited to, hiking, picnicking, quail hunting, backcountry driving, and bird and wildlife watching. This property is located within the BLM's Southwest Gila Valley LTMA. It does not include or adjoin any river segments determined by the BLM and the Department of the Interior to be eligible or suitable for Wild and Scenic Rivers designation (BLM 1994a).

Phelps Dodge has let a month-to-month grazing lease to the Norton property, which was once part of the Norton family ranch. Other than the grazing lease, no other encumbrances are associated with this property. Phelps Dodge owns the mineral estate (PD 1996). The Arizona State Land Department has filed one surface water right for 0.3 af/yr from Black Rock Wash for stock watering and wildlife use on this property.

Landscape on the Norton property consists of a dry, shallow, sandy watercourse of Black Rock Wash; its broad, relatively level floodplain; and low hills and bluffs south of the floodplain. Stands of mesquite, desert willow, Arizona black walnut, and other riparian and xeroriparian trees and shrubs growing along the wash provide the property's dominant visual interest (SWCA 1996c). Corrals, a stock tank, and a windmill are present, but no buildings or other evidence of development can be seen (Zenitech 1998b). A formal visual quality analysis has not been completed for the Norton property; however, adjacent public lands within this area have been designated as VRM Class IV (BLM 1991). The management objective of Class IV is to provide for management activities that require major modification of the existing character of the landscape.

Such activities may dominate the view and be the major focus of viewer attention. The level of change can be high, but the visual impact of the change should be minimized through careful location and minimal disturbance and by repeating the basic elements.

No federal hazardous materials National Priority List site; Arizona WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the Norton property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.2.4.2 Physical Resources. The Norton property is composed primarily of fluvial sediments overlying Pliocene to middle Miocene sedimentary rocks. The sedimentary rocks consist of pans of the Bidahochi Formation and the Bouse Formation with patches of Quaternary surficial deposits acting as caprock (Zenitech 1997). The potential for occurrence of mineral resources on this property is summarized in Table 3-41.

Table 3-41. Summary of Mineral Potential of the Norton Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Moderate	B
Locatable Metallic Minerals	Low	C
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	C

Source: D.E. Wahl 1997b

3.3.2.4.3 Biological Resources. The dominant plant on the Norton property is mesquite, many of which are very large, mature specimens growing along Black Rock Wash. Other species present include narrow-leaved yucca, rabbitbrush, catclaw acacia, creosote, desert broom, and prickly pear cacti. Trees of note on the property include mature individuals of sycamore, Arizona ash, black walnut, and desert willow. Although a riparian zone is not clearly defined, almost the entire property lies on the wash floodplain and has vegetation characteristic of an old, somewhat degraded mesquite bosque. Most larger mesquite trees have been partially harvested for wood at some time in the past, but they continue to grow well, with some exceeding 30 feet in height. The property has potential for recovery to a classic mesquite bosque (SWCA 1995c).

Wildlife or sign of wildlife observed during a recent field visit by biologists included collared peccary, coyote, mule deer, Harris' antelope squirrel, white-throated woodrat, desert cottontail, black-tailed jackrabbit, dark-eyed junco, black-throated sparrow, white-crowned sparrow, common raven, phainopepla, Gambel's quail, red-tailed hawk, verdin, golden eagle, Harris' hawk, northern oriole, Cooper's hawk, crissal thrasher, Bewick's wren, ladder-backed woodpecker, house finch, Abert's towhee, Gila woodpecker, and pyrrhuloxia (SWCA 1995c). Overall, the wildlife present on the property is expected to be typical of the habitats present. The USFWS and AGFD have reported that no federal or state listed or proposed threatened or endangered species were found in their databases for this area (SWCA 1995c).

3.3.2.4.4 Cultural Resources. The Norton property has not been systematically surveyed for cultural resources. The ranching facilities mentioned above were noted during a recent archaeological reconnaissance of the property, but no evidence was seen to suggest that they are historic in age (1995a). No Prehistoric period sites were observed during the reconnaissance, which focused on the bluffs in the southern part of the property.

3.3.2.4.5 Socioeconomic Resources. This property, taxed as Agriculture/Ranch land, generated $24 in private property taxes for Graham County in 1996. Phelps Dodge has leased the property back to the Norton family for grazing for $18/lease-year (PD 1996).

3.3.2.5 Clyne I Property

This 160-acre property is located on the western flank of the Whetstone mountains about 14 miles northeast of the community of Sonoita in Pima County, Arizona. It is the remaining portion of a 240-acre property originally included as offered lands in the proposed Morenci Land Exchange between the BLM and PD. For that project, only an 80-acre portion of the original property was approved for exchange as part of the Preferred Action Alternative. The Clyne I property considered for this exchange encompasses portions of Bear Spring Canyon and the ridge between that canyon and Shellenberger Canyon to the north. Elevations range between 4,720 and about 5,000 feet. Drainage is to the northwest via a wash in Bear Spring Canyon, then in Mattie Canyon to Cienega Creek (SWCA 1996c).

3.3.2.5.1 Land Use. The Clyne I property is located in what was formerly known as the Empirita Ranch. It is adjacent to private lands and within the perimeter of the 45,000-acre Empire-Cienega RCA (consisting of BLM and state land). Addition of this 160-acre property to the Empire-Cienega RCA would increase the RCA's total area by 0.4 percent (ibid.). Figure 2-34 shows the location of the property in relation to surrounding land ownership.

The property is accessible via a four-wheel-drive, gravel road off Highway 82, east of Sonoita. Visitors to the property must travel approximately seven miles north of Highway 82 across private, state, USFS, and BLM lands. Because the property is privately owned, no recreational uses are authorized. Potential dispersed recreational uses of the property may include, but are not limited to, hunting, hiking, camping, picnicking, backcountry driving on selected roads and routes, and bird and wildlife watching. The property is within the watershed of a segment of Cienega Creek that the BLM and the Department of the Interior have recommended for Wild and Scenic Rivers designation (ibid.).

PD has let a grazing lease to the Clyne I property, but no utilities easements, rights-of-way, or residential leases otherwise encumber the land. Phelps Dodge owns the property's mineral estate (PD 1996) and one surface water right for 2.0 af/yr from Bear Spring Canyon for stock watering.

No formal visual quality analysis was completed for this property; however, some natural resource elements that define its visual quality include an ephemeral wash, a northwest-to-southeast-trending ridge (or hogback) formed in a sequence of limestone beds that dip steeply to the south, rock outcrops, and distinct upland and xeroriparian vegetation. Rolling hills surround the property. No human-made structures or other indications of development are present (SWCA 1996c). Visual resource management objectives for the surrounding Empire-Cienega RCA are currently being developed by the BLM's Tucson Field Office as part of an overall management plan for the RCA. While the plan is not complete and VRM objectives have not been established, visual resource issues have been discussed by a team of citizens and BLM specialists.

No federal hazardous materials National Priority List site; Arizona WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the Clyne I property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located

on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.2.5.2 Physical Resources. The geology underlying the Clyne I property consists of Paleozoic and Mesozoic (Cretaceous) sedimentary rocks and some Cretaceous volcanic rocks in steeply tilted, overlapping layers. The potential for occurrence of mineral resources on this property is summarized below in Table 3-42.

Table 3-42. Summary of Mineral Potential of the Clyne I Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	B
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	C

Source: D.E. Wahl 1997b

3.3.2.5.3 Biological Resources. The grassland of the Empire-Cienega RCA is "one of the finest examples of Plains grassland in the Southwest" (Pima County Department of Transportation and Flood Control District 1992). AGFD noted during their visit to this area that uplands were "in good condition [and] supported a variety of native grasses" (AGFD 1994). In addition to these native grasses, upland vegetation observed during a recent field reconnaissance by biologists included numerous shrubs and small trees, such as mesquite, fairyduster, ocotillo, Palmer agave, shindaggers, catclaw acacia, wait-a-minute bush, desert spoon, beargrass, buckwheat, silktassel, Emory oak, Mexican cliffrose, juniper, desert sumac, and numerous species of cacti. Several small dense stands of mortonia, an uncommon species reaching its western-most limits in southeastern Arizona, were seen as well (SWCA 1995d).

Vegetation along Bear Spring Canyon wash is representative of xeroriparian drainages in southeastern Arizona, in which species composition is similar to that of the uplands, except with general greater density and volume of vegetation. No acreage estimate was made of xeroriparian plants (SWCA 1995d).

Wildlife or sign observed on the property during site reconnaissance included mule deer, desert cottontail, blacktailed jackrabbit, coyote, woodrat, javelina, several species of lizard, whitewinged dove, black-throated sparrow, Gambel's quail, eastern meadowlark, and others (SWCA 1995d). Small caves, crevices, and rock outcrops on the property provide numerous shelter sites for wildlife, including bats and carnivores. Grassland portions of the Empire-Cienega RCA are known to support small herds of pronghorn (BLM 1991). AGFD categorized habitats on the property as Resource Category III, "of high to medium value for Arizona wildlife species and are relatively abundant on a statewide basis" (AGFD 1994).

Of 16 special interest species identified by federal and state agencies as potentially occurring on the Clyne I properties, 3 are considered likely to occur with some regularity, 9 may occur occasionally, and the remaining 4 are unlikely to occur (Table 3-43).

Table 3-43. Special Interest Species Potentially Occurring on the Clyne I Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Lesser long-nose bat	*Leptonycteris curasoae*	E, SS, WSCA
Canyon spotted whiptail	*Cnemidophorus burti*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	SS
Species Unlikely to Occur		
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Huachuca golden aster	*Heterotheca rutteri*	SS
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

* Status Key: E = Federal Endangered; SS = BLM Special Staus; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1995d.

3.3.2.5.4 Cultural Resources. The property has not been surveyed for cultural resources, and no sites had been recorded there before archaeologists conducted a reconnaissance in 1995 (SWCA 1995b). During that visit, one or perhaps more sites were identified. Flaked-lithic artifacts were noted at several points over a distance of several hundred feet along the central ridge. These Prehistoric artifact scatters represent the flaking of a dark raw material found on the ridge. A more thorough examination will be required to determine whether the scatters should be recorded as one or a sequence of sites. A rock-pile feature was also noted south of the ridge; this feature may warrant site status.

Considering the presence within the property of an extensive, archaeologically significant flaked lithic scatter and a diverse plant community that might have been attractive to prehistoric and historic gatherers, it appears likely that additional significant sites are present in the area (SWCA 1995b).

3.3.2.5.5 Socioeconomic Resources. This property, taxed as Vacant Land, generated $69 in private property taxes for Pima County. A current grazing lease generates $100/lease-year for PD (PD 1996).

3.3.2.6 Clyne II Property

This 400-acre property is located at the base of the Whetstone Mountains in Pima County, approximately 0.75 mile south of the Clyne I property. Elevations range from 4,900 to 5,200 feet. Mud Spring Canyon bisects the property. Groundwater surfaces at places in the canyon to produce ponds, at least one of which appears to be perennial (SWCA 1996d). Both Mud Spring Canyon and Spring Water Canyon, which cut diagonally through the center and northwestern corner of the property, respectively, drain into Cienega Creek.

3.3.2.6.1 Land Use. The property lies within the boundary of the Empire-Cienega RCA. Addition of this property would represent a 0.8 percent increase in total area of this RCA. The property has a total perimeter of 3.5 miles, of which 2.0 miles (57 percent) to the west and east are adjacent to state land. The remaining 1.5 miles (or 43 percent) of the property's border abuts private land (SWCA 1996c). Figure 2-34 shows the location of the property in relation to surrounding land ownership.

The property is not directly accessible by vehicle, but the eastern boundary can be reached by taking a four-wheel-drive, gravel road off Highway 82, east of Sonoita; driving north approximately six miles across private, state, USFS, and BLM lands; parking at the nearest point to the property in section 23; walking about 0.5 mile across state land; and climbing two fences.

No public recreational uses are authorized on this privately owned property. Potential dispersed recreational uses of the property may include, but are not limited to, hunting, hiking, mountain biking, camping, picnicking, and bird and wildlife watching. The property has not been surveyed for caves, but is in an area of known caves and has the appropriate geological conditions for cave formation. If any caves are found on the property, then recreational caving could be available. The property lies within the watershed of a segment of Cienega Creek that the BLM and the Department of the Interior have recommended for Wild and Scenic Rivers designation as "Scenic" (SWCA 1996c).

PD has let a grazing lease to this property and easements were given to the former owner for a road and water pipeline. Evidence of a rudimentary, unpassable, two-track roadway was noted during a site investigation, but the water line was not found and may not exist (SWCA 1996c). No other utilities easements, rights-of-way, or residential leases encumber this property. Phelps Dodge owns the mineral estate of the property (PD 1996) and one surface water right for 2.0 af/yr from Mud Spring Canyon for stock watering.

No formal visual quality analysis was completed for the Clyne II property; however, some natural resource elements that define its visual quality include a low-relief canyon (Mud Spring Canyon); rock outcrops; perennial pond(s); and distinct upland, xeroriparian, and hydroriparian vegetation. Rolling hills can be seen for many miles in every direction (SWCA 1996c). No human-made structures or other indications of development exist on the property (Zenitech 1998b). Visual resource management objectives for the surrounding Empire-Cienega RCA are currently being developed by the BLM's Tucson Field Office as part of an overall management plan for the RCA. While the plan is not complete and VRM objectives have not been established, visual resource issues have been discussed by a team of citizens and BLM specialists.

No federal hazardous materials National Priority List site; Arizona WQARF site; zipACIDS site; or RCRA transport, storage, or disposal facility is located within one mile of the Clyne II property. No LUST sites or open or closed landfills are located on or within 0.5 mile of the property. No registered UST sites are located on the property or on adjacent properties. No ERNS sites are located on the property or in the vicinity (Zenitech 1998b).

3.3.2.6.2 Physical Resources. The underlying geology of the Clyne II property consists of Holocene-to-middle Pleistocene surficial deposits in the canyon floor, bounded above by sedimentary rocks, primarily of Cretaceous age, with local volcanic units (Zenitech 1998b). The potential for occurrence of mineral resources on the Clyne II property is summarized below in Table 3-44.

Table 3-44. Summary of Mineral Potential of the Clyne II Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	B
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	C

Source: D.E. Wahl 1997b

3.3.2.6.3 Biological Resources. Upland vegetation on the Clyne II property is characteristic of plains grassland in southeastern Arizona as it makes a transition to Semidesert Grassland. Most of the ground is covered with a variety of native grasses. Shrubs and succulents are widely scattered or occasionally form clusters or patches. Grass species present include blue grama, black grama, side-oats grama, tanglehead, bullgrass, bush muhly, plains bristlegrass, three-awn, and Lehmann lovegrass. Other upland species include catclaw acacia, white-thorn acacia, beargrass, mesquite, fairyduster, ocotillo, narrow-leaved yucca, Palmer agave, wait-a-minute bush, sotol, buckwheat, silk tassel, Emory oak, Mexican cliffrose, Coahuila juniper, alligator juniper, desert sumac, scrub oak, and several species of cacti including flat cream pincushion, Bisbee beehive cactus, Fendler needle hedgehog, Arizona rainbow cactus, prickly pears of two species (*Opuntia phaeacantha* and *O. macrorhiza*) and cane cholla. Mortonia, an uncommon species reaching its western-most limits in southeastern Arizona, is present in several patches on the property, and is the dominant species on the slopes above the largest pond. Drainages have a distinct xeroriparian community of mixed oaks, including Emory oak, net-leaf oak, and scrub oak, with squaw bush, sugar sumac, both juniper species, beargrass, bullgrass, and other species. Along the upper part of Mud Spring Canyon, a small hydroriparian community includes a few young Fremont cottonwoods, Goodding willows, seep-willows, and an understory of grasses and spikerushes (SWCA 1996d).

Wildlife or wildlife sign observed during a field reconnaissance included pronghorn, mule deer, blacktailed jackrabbit, coyote, raccoon, javelina, mountain lion, rock squirrel, mourning dove, canyon towhee, Chihuahuan raven, dark-eyed junco, horned lark, Gambel's quail, song sparrow, lesser goldfinch, house finch, verdin, mountain bluebird, black phoebe, eastern meadowlark, and canyon treefrog. No leopard frogs were seen, but habitat appeared suitable for leopard frogs. Small caves, crevices, and rock outcrops provide numerous shelter sites for wildlife including bats and carnivores. The Whetstone Mountains contain several caves, including Kartschner Caverns State Park on the east side and Red Cave, an important archeological site, on the west side. This property has not been adequately explored for caves, but has geological characteristics that suggest a possibility of cave formation (SWCA 1996d).

Of 21 special interest species identified by federal and state agencies as potentially occurring on the Clyne II property, none are considered likely to occur with some regularity, 17 may occur occasionally, and the remaining 4 are unlikely to occur (Table 3-45).

Table 3-45. Special Interest Species Potentially Occurring on the Clyne II Property

Species' Common Name	Scientific Name	Status*
Species That May Occur Occasionally		
Lesser long-nose bat	*Leptonycteris curasoae*	E, SS, WSCA
American peregrine falcon	*Falco peregrinus anatum*	E, SS
Wilcox fishhook cactus	*Mammillaria wrightii wilcoxii*	SS, SR
Sonoran Desert tortoise	*Gopherus agassiz*	SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Canyon spotted whiptail	*Cnemidophorus burti*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Long-legged myotis	*Myotis volans*	SS
Fringed myotis	*Myotis thysanodes*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	SS
Species Unlikely to Occur		
Northern aplomado falcon	*Falco femoralis*	E, SS, WSCA
Mexican spotted owl	*Strix occidentalis lucida*	T, SS
Bunchgrass lizard	*Sceloprous scalaris*	SS, WSCA
Arizona Ridgenose rattlesnake	*Crotalus Willardi Willardi*	SS, WSCA WSCA

* Status Key: E = Federal Endangered; SS = BLM Special Staus; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1996d.

3.3.2.6.4 Cultural Resources. The Clyne II property has not been surveyed for cultural resources, and no sites have been formally recorded in the study area. During a recent reconnaissance by archaeologists, one site (and possibly more) was identified (SWCA 1996a). Flaked-lithic artifacts were widely dispersed throughout the study area. Small caves, crevices, and rock outcrops, particularly in the northern-most reaches of the property, may be conducive for use as shelter by prehistoric peoples. Over most of the property, the limestone is overlain with poorly sorted colluvium containing a variety of rock types. Many of the lithic artifacts observed in the study area appear to represent "testing" colluvial cobbles for material types (chert, quartzite, etc.) in an effort to find stone suitable for manufacture of stone tools (SWCA 1996a).

Considering the presence within the Clyne II property of an extensive, archaeologically significant flaked-lithic scatter, perennial water, natural rock shelters, and a wide diversity of plant and animal communities that might have been attractive to prehistoric and historic gatherers, it appears very likely that additional significant sites are present in the area (SWCA 1996a).

3.3.2.6.5 Socioeconomic Resources. This property, taxed as Agriculture/Ranch land, generated $2,422 in private property taxes for Pima County in 1996. Currently, a grazing lease for the property generates approximately $100/lease-year for PD (PD 1996).

Chapter 4: Environmental Consequences

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION AND CHAPTER ORGANIZATION

This chapter presents the direct, indirect, and cumulative impacts of the Proposed Action and its alternatives. The analyses of impacts discussed here are the basis for the comparative summary of alternatives provided in Table 2-14 in Chapter 2. These analyses, which are organized initially by the two alternatives sets, then internally within those sets by major category as presented in Chapter 3, incorporate certain assumptions.

4.2 IMPACT ANALYSIS ASSUMPTIONS

The following assumptions were made in analyzing the direct and indirect environmental impacts of the alternatives considered in this EIS.

- Direct impacts are those that are caused by the action being analyzed and occur at the same place and time as the action; indirect impacts are those that are caused by the action but are removed in distance and/or occur later in time within the reasonably foreseeable future.
- Because federal and other permits are still required in order to implement mining activities on the selected lands if the land exchange is allowed, the land exchange alternative does not cause the foreseeable mining uses of the selected lands, although it does enable them. Therefore, the impacts associated with the foreseeable uses are not directly or indirectly caused by the land exchange.
- Short-term impacts are those which occur during or as a result of activities within the 15-month long Project construction period. Long-term impacts are those that are expected to occur during or as a result of activities proposed for the 16-year mining operations and reclamation.
- Mitigation measures for a direct impact may preclude other direct impacts from occurring. For example, mitigation for impacts to surface flows of the Gila River would result in no net impact on surface flows, thereby avoiding impacts to other resources associated with surface flows, e.g., listed species and Indian water rights. Similarly, mitigation for impacts resulting from the exchange may preclude impacts of foreseeable uses (e.g., archaeological sites).
- For the land exchange alternative, the foreseeable uses of the selected lands include those actions described under the Proposed Action alternative (the Dos Pobres/San Juan Project) as well as the foreseeable uses anticipated to occur later if PDSI develops the Dos Pobres sulfide and Lone Star orebodies as described in Section 2.2.2.1.2.
- Implementation of the foreseeable uses of the selected lands would require PDSI to obtain all applicable federal, state, and local permits and comply with all applicable environmental laws and regulations, regardless of land ownership.

- In the absence of site-specific design criteria, the surface disturbance impacts of the foreseeable uses of the selected lands for the possible Dos Pobres sulfide and Lone Star projects are assumed to be the maximum of the range anticipated, as defined below:

  - Production Operations and Support Use Areas: 100 percent surface disturbance
  - Transition Use Areas: 25 percent surface disturbance
  - Intermittent Use Areas: 5 percent surface disturbance

- Impacts to the human environment of the No Land Exchange alternative are expected to be the same as those described for the Proposed Action or Partial Backfill alternatives. This assumption is based on the fact that PDSI has submitted a Mining Plan of Operations to the BLM for consideration (the Proposed Action) and that BLM must authorize any mining plan that includes adequate provisions to prevent unnecessary and undue degradation of the environment; includes measures to provide for reclamation of disturbed land; and complies with other applicable federal and state laws and regulations. The COE and EPA are also evaluating the proposed mining operations under their respective Clean Water Act jurisdictions and it is reasonable to assume that either of the action alternatives in the Mine Plan Alternatives Set or some modification of these will fulfill these three requirements. Therefore, it has been assumed for the purposes of this analysis that mining activities would proceed on portions of the selected land whether the proposed exchange is approved or not.

- All acreage provided in this document are based on data calculated using Computer-Assisted Drafting (CAD) software and are approximate but correct in magnitude. Totals in tables may not add up due to rounding error. Prior to any proposed realty action, actual acreage of selected and offered lands would be calculated using cadastral survey or some other BLM-approved method.

4.3 MINE PLAN ALTERNATIVES IMPACT ANALYSIS

4.3.1 Land Use

4.3.1.1 Public Lands Management

4.3.1.1.1 Proposed Action Alternative. Under this alternative, the approximately 1,935 acres of BLM-administered lands proposed for use in the MPO would be developed by PDSI, with federal oversight by BLM under Section 3809 of FLPMA and by COE and EPA under Sections 404 and 402, respectively, of the Clean Water Act. BLM's short- and long-term management responsibilities for these lands would increase as part of the BLM's review and oversight of the MPO and reclamation activities on public lands. These responsibilities include ensuring compliance with federal and state laws and regulations; environmental analysis of any proposed major modifications in the MPO; securing adequate bonding; oversight of monitoring and mitigation measures other than those specifically under the jurisdiction of other agencies; and oversight of reclamation activities and post-mining land uses (PMLUs).

No special management areas, such as wildernesses, ACECs, wild and scenic rivers (including recommended segments), or NCAs, would be directly impacted by this alternative. The Gila Box RNCA is not expected to be affected by the Project because the Bonita Creek portion of the RNCA occupies a separate watershed (surface water and groundwater), and the Gila River portion of the RNCA lies upstream of project area drainage. Potential access impacts to these public recreational areas is discussed under Section 4.3.1.2.1.

Visitors' recreational use of special management areas in the Safford Field Office would likely increase by an unquantified amount as an indirect impact of the Proposed Action alternative due to the slight increase in Graham County's population as a result of additional employment from the Project; this would also indirectly increase BLM's management responsibilities for public lands within the Safford Field Office by some small, but undetermined amount.

4.3.1.1.2 Partial Backfill Alternative. None of the mining activities proposed under this alternative would result in impacts to management of public lands, including special management areas, different from those described for the Proposed Action alternative. BLM's increased management responsibilities for mining oversight and administrative requirements would be identical to those needed to oversee the Proposed Action alternative.

4.3.1.1.3 No Action Alternative. The No Action alternative would result in no changes to the existing management of public lands, including special management areas, by the BLM Safford Field Office. Although there would be no mining activities permitted by either the COE or EPA, the BLM, as part of its public lands management responsibilities, would continue to work with PDSI to modify the rejected MPO and develop an acceptable mine plan, as required by 43 CFR 3809. PDSI would then have to resubmit modified Section 404 and 402 (NPDES) permit applications to COE and EPA, respectively, for environmental review.

4.3.1.2 Access and Recreation

4.3.1.2.1 Proposed Action Alternative. Approval of the Dos Pobres/San Juan Project would result in the closure of public access on the upper part of San Juan Mine Road, which the public currently uses to reach recreation areas in the Gila Mountains. Public access on the lower three to four miles of San Juan Mine Road would still be available, allowing the public to access public lands south of the project area. However, public access to the Gila Box RNCA, Bonita Creek, Johnny Creek, the Safford-Morenci Trailhead, and the north side of the Gila Mountains would still be available via the Solomon Pass Road. Currently, using Solomon Pass and West Ranch Road to get to Johnny Creek and the Safford-Morenci Trailhead requires a somewhat longer travel time (about 15 to 30 minutes more) than using the San Juan Mine Road (S. Knox, BLM, pers. comm.). Loss of public access on San Juan Mine Road would affect an estimated maximum of 2,800 to 3,100 backcountry drivers who use this area each year for recreational driving; the majority of these recreationists would likely continue to access the Gila Mountains and Gila Box via the alternate route on Solomon Pass Road.

This alternative would also remove the approximately 1,935 acres of public lands proposed for mining from public use for dispersed recreation. Since the majority of recreational use of the these lands is for access to other public recreational areas or for hunting in AGFD Hunt Unit 28, this alternative is not expected to cause a drop in visitor use in the area. The approximately 240 hunters per year would have to hunt in other locations in the Unit. Four BLM commercial special recreation permit holders would not be able to use the selected lands if their permits are renewed (although outfitters probably only use the public lands in question for access to other public lands) (S. Knox, BLM, pers. comm.). Horseback riders and mountain bikers would also be similarly impacted by loss of public access in the project area. In particular, the annual Safford Johnny Creek Equestrian Endurance Ride may have to be rerouted under this alternative because the current route passes through public lands in the proposed MPO area.

This alternative also creates recreational opportunities in the form of post-mining land uses involving education and tourism. Education and tourism objectives would be achieved by constructing and providing public access to a lookout point in the hills above the project area from where the public can read signage and view the mine pits and other facilities. The possibility of offering mine tours would be evaluated in the future (J. Korolsky, PDSI, pers. comm.).

4.3.1.2.2 Partial Backfill Alternative. This alternative would result in direct and indirect impacts to access and recreation in the project area that are identical to those described for the Proposed Action alternative.

4.3.1.2.3 No Action Alternative. As no mining activities would be permitted under this alternative, no changes to existing public access or recreational uses of the project area would be expected. The San Juan Mine Road and PD Mine Road would remain open to public access. Dispersed recreational use would continue to occur on the public lands in project area, including hunting in AGFD Hunt Unit 28, recreational driving, horseback riding, and mountain biking. Subject to an annual BLM special use permit and PD authorization, the Safford Johnny Creek Equestrian Endurance Ride could continue to use the current route over both public and PD private lands.

4.3.1.3 Encumbrances

4.3.1.3.1 Proposed Action Alternative. This alternative would directly affect the seven rights-of-way (ROWs) existing on public lands in the project area. Four of these are for electric power transmission and distribution lines; two are for telephone and telegraph lines; and one is for a radio communication site and access road; all were authorized by BLM originally to provide these services to either PDSI or the former mining operator(s). Based on the MPO, PDSI would relocate portions of the four power and two telephone lines as necessary to develop the Project and BLM would reissue the ROWs. The ROW for the radio communications site and access road would also be relocated to the south in Section 10 atop a hill on which PDSI proposes to construct a telecommunications repeater tower.

4.3.1.3.2 Partial Backfill Alternative. This alternative would result in identical impacts to ROWs and easements to those described for the Proposed Action alternative.

4.3.1.3.3 No Action Alternative. There would be no change in the existing legal rights-of-way or easement agreements that the BLM has made for the project area.

4.3.1.4 Agriculture/Grazing

4.3.1.4.1 Proposed Action Alternative. No unique or prime farmlands are located in the project area and no direct or indirect impacts to such lands are expected.

Four grazing allotments administered by the Safford Field Office would be directly impacted by this alternative. These are the Bryce, Talley Wash, Lone Star, and Johnny Creek allotments. Portions of these allotments would be fenced off and unavailable for continued grazing (as depicted in Figure 4-1) due to safety and site security reasons. Table 4-1 summarizes the approximate acreage of public and PD-owned lands that would be removed from each allotment by the fencing and the corresponding reduction in each allotment's stocking capacity measured in Animal Unit Months (AUMs), as a result of the Proposed Action alternative.

The Safford Field Office's annual grazing receipts would be reduced by approximately $144 ($1.35/AUM) as a result of the 107 AUMs removed by this alternative. Eight BLM-registered range improvements, of portions thereof, including the Bryce-Talley Wash, Stewart-Golding, and Golding-West fences, three dirt tanks, the 4612/4613 boundary fence, and the Peterson Wash pipeline, would be affected by this alternative. These improvements are located within the proposed fenced area surrounding the Project; allottees would be compensated for the loss of use or access to these facilities if this alternative is selected.

4.3.1.4.2 Partial Backfill Alternative. This alternative would result in impacts that are identical to those described under the Proposed Action.

Table 4-1. Acreage of Public and PD-Owned Lands Removed from Each Allotment as a Result of the Proposed Action Alternative, and Corresponding Reduction in the Allotment's Stocking Capacity

ALLOTMENT (Operator)	Total Allotment (acres)	Acreage Removed from Allotment Due to Project		Reduction in Stocking Capacity	
		Public Lands	PD Lands	Public Lands AUMs (%)	PD Lands AUMs (%)
Bryce Allotment (G. Bryce)	54,000	455	770	12	18
Talley Wash Allotment (Page Land & Cattle Co.)	9,703	3,766	2,310	49	30
Rest Haven Allotment (B. Smith & B. Bell)	2,317	0	0	0	0
Lone Star Allotment (Phelps Dodge Corporation)	31,829	615	179	20	6
Johnny Creek Allotment (K. Curtis)	23,291	333	365	26	28
Bonita Creek Allotment (C. Amado)	25,171	0	0	0	0
TOTAL	**146,311**	**5,169**	**3,624**	**107**	**82**

4.3.1.4.3 No Action Alternative. The No Action alternative would not affect the current grazing use of the BLM lands in the project area. The six allotments in the project area would continue to be grazed at their current stocking rates and allottees would continue to have access to and use of registered range improvements in their allotments. BLM would continue to receive grazing income for the current stocking capacity of the allotments.

4.3.1.5 Mineral Rights

4.3.1.5.1 Proposed Action Alternative. No direct or indirect impacts on federal mineral rights would occur as a result of this alternative, since PD owns all federal mining claims appurtenant to the public lands proposed for mining. The State of Arizona's subsurface mineral rights in Sections 16 and 32 would not be impacted by development of the Project.

4.3.1.5.2 Partial Backfill Alternative. Like the Proposed Action, this alternative would have no impact on PD's or other parties' federal or state mineral rights, i.e., the legal right to develop a mining claim. However, this alternative could preclude future mining of low-grade copper ore and/or result in extra costs associated with possible future extraction of such ore in the San Juan mine as backfilling of the pit is not a customary or usual mining practice.

4.3.1.5.3 No Action Alternative. Selection of this alternative by the BLM, COE, and EPA would not affect PD's or other parties' mineral rights to the project area. Development of minerals on public lands is encouraged by the General Mining Law of 1872 (under which PD and the Melody Claims Group have filed 844 and 40 mining claims on the project area, respectively); 43 CFR Section 3809 regulations (under which PDSI has submitted the Dos Pobres/San Juan Plan of Operations); the Mining and Mineral Policy Act of 1970; and the National Materials and Minerals Policy, Research, and Development Act of 1980. However, such development is subject to approval of a plan of operations that meets the requirements of applicable environmental laws and regulations.

The only condition under which the BLM may reject a mining plan is when that plan would result in unnecessary or undue degradation of the environment. According to regulations at 43 CFR 3809.0-5(k),

"Failure to comply with applicable environmental protection statutes and regulations thereunder will constitute unnecessary or undue degradation." To determine whether a proposed MPO would cause such degradation, the BLM oversees an analysis of environmental impacts as required by provisions of the National Environmental Policy Act (NEPA). The BLM also relies on analyses conducted by permitting agencies—such as the COE, EPA, and ADEQ—whose permitting jurisdictions arise from federal environmental statutes such as the Clean Air Act and Clean Water Act. The implementing regulations of these statutes provide quantitative and qualitative criteria for demonstrating environmental compliance. In the case considered by this EIS, the No Action alternative would only be selected if both the Proposed Action and the Partial Backfill alternatives failed to meet the criteria stipulated for the required permit(s). If that were to happen, the COE, EPA, and/or ADEQ could not issue the permit(s); the BLM could not authorize either the Proposed Action or the Partial Backfill mining plans; and the project proponent (PDSI) could not mine under either plan. PD's right to mine their claims under a *permittable* mine plan, however, would remain unchanged.

4.3.1.6 Surface Water Rights

4.3.1.6.1 Proposed Action Alternative. Although ownership of surface water rights in the project area would not be impacted by the Proposed Action alternative, the proposed security/grazing fence around the mine site would physically preclude access to and use of surface water rights within the fenced boundary. Seventeen surface water rights totaling 66.85 acre-feet per year (af/yr) located on BLM lands and four surface water rights totaling 75.97 af/yr located on PD lands would be directly impacted. Holders of these rights, as listed in Tables 4-2 and 4-3, respectively, would be compensated for their losses.

This alternative also has the potential to indirectly affect surface water rights to the Gila River. Use of Gila River flows is subject to an ongoing adjudication of water rights in U.S. District Court and Maricopa County Superior Court. Any reduction in surface flows in the Gila River or its tributaries, if unmitigated, would be considered an illegal "taking" of higher priority water rights. This alternative would result in the long-term maximum reduction of 75.4 af/yr in surface flows in the Gila River from two sources: groundwater pumping effects (35.4 af/yr) and retention of surface water runoff for stormwater management (40 af/yr) (Dames & Moore 1997g and 1998e). The projected maximum reduction of 35.4 af/yr in river flows resulting from groundwater pumping is described in detail in Section 4.3.2.5.1. Based on technical studies completed by Dames & Moore (1998c), it is estimated that this alternative would cause a net reduction in the average annual runoff of five of the major washes in the project area by approximately 40 af/yr (see Table 4-4) (Dames & Moore 1998e). This direct, long-term impact represents the projected difference in runoff between the baseline and post-project watershed conditions.[1] This projected volume of impact to surface flows in the Gila River would be mitigated as described in Appendix F. Therefore, no unmitigated impacts to surface water rights to the Gila River or its tributaries are anticipated as a result of this alternative.

4.3.1.6.2 Partial Backfill Alternative. This alternative would result in impacts to surface water rights that are identical to those described for the Proposed Action alternative.

4.3.1.6.3 No Action Alternative. As no mining activities or surface disturbance would be authorized, this alternative would not affect existing surface water rights on the public lands in the project area or surface water rights to the Gila River.

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[1] In accordance with water rights law, the surface areas of facilities that capture incidental sheet flow prior to it becoming channel flow are not included in the calculation of the initial (baseline) watershed area when estimating the reduction of average annual runoff caused by development of the Dos Pobres/San Juan Project. Therefore, the baseline watershed area was calculated by subtracting the surface area of the facilities that would capture sheet flow from the existing watershed. The post-project watershed represents the project site after complete mine development. Facilities capturing incidental sheet flow consist of the leach pad, Dos Pobres and San Juan pits, East and West development rock stockpiles, stormwater impoundment, SX/EW plant, soil stockpiles, and aggregate and compactible soil borrow sources.

Table 4-2. Potential Impacts to Surface Water Rights on BLM Lands Under the Proposed Action and Partial Backfill Alternatives

Registry No.	Holder	Impact	Volume (af/yr)
36-0072391	Page Land & Cattle Co. (PL&C)	Under leach pad	0.20
36-0072392	PL&C	Near ore surge pile and road	0.20
36-0072393	PL&C	Under temporary laydown area	0.20
36-0072394	PL&C	Under leach pad	0.20
36-0072395	PL&C	Under aggregate borrow source area	0.10
38-0019207	BLM	Near road to SJ truck shop complex	10.00
38-0019208	BLM	Under leach pad	10.00
38-0019209	BLM	No direct impact; within fence	10.00
38-0019273	BLM	Under temporary laydown area	10.00
38-0019274	BLM	Under truck reloading facility	10.00
38-0019287	BLM	Near South diversion channel	1.30
38-0024941	Phelps Dodge	Under San Juan pit	10.00
38-0072385	PL&C	Near leach pad area	0.20
38-0072386	PL&C	Under soil stockpile area	0.60
38-0072387	PL&C	Near leach pad area	1.20
38-0072388	PL&C	Under temporary laydown area	1.75
38-0072389	PL&C	Near ore surge pile	0.90
		TOTAL	**66.85**

Table 4-3. Impacts to Surface Water Rights on PD's Private Lands under the Proposed Action and Partial Backfill Alternatives

Registry No.	Holder	Impact	Volume (af/yr)
36-0060073.1	G.A. Bryce	Under West development rock stockpile area	1.61
36-0072390	Page Land & Cattle	Near Dos Pobres setback and powerline	0.30
4A-0002478	G.A. Golding	Within fenced area	1.68
4A-0001418	PL&C	Within Dos Pobres Mine setback	72.38
		TOTAL	**75.97**

Table 4-4. Potential Change in Average Annual Runoff to the Gila River Resulting from the Proposed Action

Wash	Watershed Area (ac)		Average Annual Runoff (af)		Net Change in Annual Runoff (af)
	Baseline Condition	*Post-Project Condition*	*Baseline Condition*	*Post-Project Condition*	
Butler	12,822	14,066	260	289	29
Watson	6,222	3,707	120	68	(52)
Talley	5,220	4,651	96	85	(11)
Peterson	11,961	11,643	244	238	(6)
Lone Star	6,815	6,815	128	128	0
TOTAL	**43,040**	**40,882**	**848**	**808**	**(40)**

4.3.1.7 Blasting Noise and Vibrations

4.3.1.7.1 Proposed Action Alternative. Noise and vibrations caused by blasting at the Project, while scheduled to occur daily, would be of a relatively low magnitude and extremely short duration. They are not expected to adversely affect either the residents or structures in the Safford area or the telescope operations on Mt. Graham approximately 15 air miles away.

Air blasts (sound pressure, measured in decibels [dB]) and ground motion (vibrations, measured in peak particle velocity in in/sec) are common effects of pit blasting. The severity of these effects depends upon the instantaneous charge per delay, distance from the source, and a variety of other geophysical and atmospheric factors. To determine the likely nature of the air blasts and ground motions that would result from mine blasting at Dos Pobres and San Juan, a study was undertaken using standard formulas developed by Ladegaard-Pederson and Dally (1975) for estimating sound pressure and by U.S. Bureau of Mines and others for estimating ground motion (Physical Resources Engineering 1997). To conservatively estimate sound pressure of proposed blasting, 10 percent of the value for the upper limit of the curve for an unconfined blast was used, given that the design of the blast is substantially confined within the drilled rock (ibid.).

Under this alternative, blasting at the mine sites is expected to occur during daylight hours, once or possibly twice a day at each pit, seven days per week. Proposed blasting techniques are described in Chapter 2. Based on the anticipated maximum charge load of 6,000 lbs, and the distances from the pit areas to the nearest residential area and the Mt. Graham observatories (approximately 7 and 15 miles, respectively), expected sound pressure and ground motion were calculated for these sites. Table 4-5 provides these data, and Figure 4-2 shows sound pressure and ground motion levels at 2-, 7-, and 10-mile radii from the mine pits.

Table 4-5. Estimated Sound Pressures and Peak Particle Velocities for Safford and the Mt. Graham Observatories from Mine Blasting

Location	Distance (ft)	Sound Pressure (dB)	Peak Particle Velocity (in/sec)	
			low est.	high est.
Safford	36,960	96	0.0013	0.0134
Mt. Graham	104,016	89	0.0003	0.0026

Source: Physical Resources Engineering, Inc. 1997

To put these data into context, refer to Figure 4-3 and Table 4-6. Figure 4-3 shows the human and structural response to sound pressure levels and the range of sound pressure levels expected from air blasts from explosions. Levels of sound pressure exceeding 120 dB generally produces annoyance; however, the expected sound pressure at Safford (96 dB) and Mt. Graham (89 dB) from blasting in the project area falls well below the "annoyance" level and well within the scaled distance requirements recommended by researchers (Physical Resource Engineering 1997). For residential areas near Safford, the expected sound pressure level of the blasts would be similar to that of a riveter, but for extremely short durations. At the Mt. Graham Observatories, roughly 15 miles southwest of the project area, the expected sound pressure from blasting would be more similar to the noise generated by the pulse of a kitchen blender.

Table 4-6. Comparison of Vibrations in a Test Fatigue Structure from Six Human Activities

Location of Receptor in Test Fatigue Structure	Maximum Structure Vibrations (in/sec)					
	Jumps	Heel Drops	Entrance Door Slams	Sliding Glass Door Slams	Nail Hammering	Walking
NW corner	0.190	0.055	0.220	0.110	0.100	0.056
SE corner	0.310	0.139	0.182	0.164	0.508	0.157
S wall	1.44	0.783	1.29	0.136	0.241	0.225
W wall	1.00	0.486	1.05	0.124	0.365	0.086
Mid-floor	10.1	5.84	0.453	0.272	0.067	0.286

Source: Physical Resources Engineering, Inc. 1997, Table 5

Table 4-6 presents data comparing vibrations generated by six kinds of human activities in a test fatigue structure. Compared to these data, the estimated vibration levels from blasting at the Project that would affect structures in the Safford area (0.0013 to 0.0134 in/sec) would fall well below vibrations caused by someone walking through the structure (0.056 to 0.286 in/sec). At the Mt. Graham Observatories, vibrations would be almost imperceptible (0.0003 to 0.0026 in/sec) and of extremely short duration. It is anticipated that they would not interfere with telescope operations.

4.3.1.7.2 Partial Backfill Alternative. The noise and vibrations associated with blasting would be identical as those described for the Proposed Action alternative.

4.3.1.7.3 No Action Alternative. This alternative would result in no mining activities, including blasting; therefore, no noise or vibrational impacts associated blasting would be expected.

4.3.1.8 Visual Resources

4.3.1.8.1 Proposed Action Alternative. The Project would result in permanent modifications to the existing character of the landscape. Construction of the pits, leach pad, development rock and soil stockpiles, aggregate and compactible soil borrow pits and overburden stockpiles, access and haul roads, stormwater management facilities, shops, communications facilities, tanks and storage buildings, and other facilities would become a major focus of viewers' attention from viewpoints in the Safford Valley looking in the direction of the Gila Mountains. A computer-generated photographic visual simulation of the Project depicting the anticipated view at full build-out from a central point in Safford near Highway 70 and 20th Avenue is provided as Figure 4-4. Based on this simulation and those from two other viewpoints only, BLM prepared a visual contrast rating describing and evaluating the proposed changes in the character of the existing landscape (Knox 1997). The analysis that follows describes the anticipated changes in the scene as depicted in Figure 4-4.

By the end of the 16-year Project, two development rock stockpiles, the leach pad, and the upper part of the back wall of the San Juan pit would be visible on the terrace above the Gila River as part of a background view of the valley (ibid.). At about 400- to 450-feet tall, the West Development Rock Stockpile would appear mesa-like, with the front half being visible and the remainder being hidden behind the leach pad. The East Development Rock Stockpile, while much smaller, would only partially be hidden by one of the foothills. The leach pad would also be mesa-like in appearance and fully visible. The ultimate Dos Pobres pit would not be visible from the center of Safford as the leach pad lies in front of it and only the upper back wall of the ultimate San Juan pit would be visible (ibid.). Together, these facilities span a distance of about four miles across the base of the Gila Mountains. None of these facilities rises above the silhouette of the mountains.

Horizontal lines created by the tops of the mesa-like pad and development rock stockpiles and the stormwater diversions and the diagonal lines created by the side slopes of the pad and rock stockpiles would be apparent to viewers and would contrast with the ragged horizon of the Gila Mountains (ibid.). To some degree, the mesa-like forms would blend with other physiographic features in the Gila Valley, such as the terraces along and parallel to the Gila River and Frye Mesa at the base of Mt. Graham.

The rock stockpiles and leach pad would probably be greyish, with a blue to purplish tint or brownish-reddish tint depending on the lighting, time of day, distance, etc. The visual cuts made by the stormwater diversions and the upper backwall of the San Juan pit may be slightly lighter in color than the stockpiles, but all the mining features would appear relatively smooth-textured from most in-town views

As the project area becomes revegetated, the color and lines of the pad, rock stockpiles, pits, and roads would be softened slightly, but would still be noticeable (ibid.). Blocky and angular human-made structures in the form of buildings, shops, and telecommunications facilities would contrast with the mesa-like forms of the leach pad and development rock stockpiles, although paint color(s) would be chosen to blend in with the general color of the mountains in the background.

The Project's nighttime operations would require a certain amount of lighting for safety purposes, but such lighting would be in compliance with the Graham County Lighting Ordinance, which requires shielding of outdoor lights, down-turned lights, and sodium lighting. Some lights used for nighttime operations at the Project would be visible from Safford and other view points within the Safford Valley, but are not expected to affect astronomical observations at Mt. Graham. Potential sources of night lighting that would be visible from locations within the valley include the truck shop, haul trucks driving to and from the pits and various stockpiles, the SX/EW plant, and portable light-plants placed on stockpiles during night operations for safety reasons. The degree to which each of these lighted facilities would be visible varies with the viewer's location. The East development rock stockpile and natural topography such as river terraces and foothills would likely block views of the truck shop, especially from viewpoints in the western part of the valley. For

viewers on the eastern part of the valley, the leach pad would likely block views of the Site No. 1; viewers from the west site would not likely see Site No. 2 or the crusher facility behind the pad. The visibility of haul truck head lights would vary much during the course of operations, depending upon the route and the location of active dump areas on each stockpile. The most visible night lighting at the Project would likely be the portable light-plants, which are generators with pole-mounted spot lights that are used so that haul trucks can back up safely on the stockpiles. There are typically one or two light-plants at each active dumping area.

4.3.1.8.2 Partial Backfill Alternative. Anticipated impacts to visual resources distinguish this alternative from the Proposed Action alternative. In general, this alternative would result all of the same direct visual resource impacts to the form, line, texture, and color or the existing landscape as the Proposed Action, with the following exceptions. While this alternative would still be considered a major modification of the existing character of the landscape, this alternative slightly reduces the Project's overall visual impact by slightly reducing the height of both the West and East development rock stockpiles by about 50 feet (one lift) as compared to the Proposed Action. This height reduction is achieved by backfilling about 21 percent (80 million tons) of the total development rock (about 365 million tons) into a portion of the mined-out San Juan pit. The form of the stockpiles, however, would still be mesa-like or terrace-like to the viewer and would still be below the horizon created by the crest of the Gila Mountains, although with somewhat reduced heights, the visual mass of the stockpiles would be decreased compared to those of the Proposed Action alternative.

Visual quality impacts from the Project's nighttime lighting would be identical to those of the Proposed Action alternative from Years 0 through 9; in Year 10 and following, however, when backfilling starts, nighttime lighting impacts would be reduced somewhat since some light-plants on active dump areas would likely be located below the line of sight within the San Juan pit.

4.3.1.8.3 No Action Alternative. Under this alternative, visual resources in the project area would remain unchanged as no mining would occur. BLM would continue to manage their lands per the applicable visual resource management objectives.

4.3.1.9 Hazardous Materials

4.3.1.9.1 Proposed Action Alternative. This alternative would not affect any listed federal "Superfund" or state WQARF sites, RCRA sites, ERNS sites, UST sites, LUST sites[2], or open or closed landfills. One zipACIDS[3] site, the San Juan Mine site, lies primarily on PD's private lands and would be directly affected by the Project. Since this site lies within the proposed San Juan pit, the zipACIDS site would be eliminated as mining commences. The pit lake water that now exists at the San Juan pit would become entrained in the process make-up waters for mining operations once mining commences at San Juan.

As required by the Mine Safety and Health Administration (MSHA), PDSI must comply with all required safety measures regarding the transport, use, and storage of hazardous materials. All hazardous materials would be transported, handled, and disposed of per the requirements of the Resource Conservation and Recovery Act of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act

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[2] "Superfund" sites are on the National Priority List for remediation under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); state hazmat sites are also called Arizona Water Quality Assurance Revolving Fund (WQARF) sites; RCRA = Resource Conservation and Recovery Act; ERNS = Emergency Response Notification System; UST = Underground Storage Tanks; LUST = Leaking Underground Storage Tanks.

[3] ZipACIDS sites are locations in Arizona, sorted by zip code, subject to investigation under the State WQARF program and the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for possible contamination of surface water or groundwater; listing as a zipACIDS site does not mean that the location is contaminated, is causing contamination, or is in violation of state or federal statutes or regulations.

of 1980, as amended. To meet these requirements, PDSI has incorporated numerous safety features into the mine plan, such as double containment systems for the storage and use of sulfuric acid solutions, reagents, diluent, fuel, and other petroleum products (see Section 2.1.2.3.5 for details). The shipping company selected by PDSI to transport sulfuric acid to and from the mine would be required to comply with the applicable federal and state regulations governing the transport of cargo, including hazardous materials. The internal controls for transporting sulfuric acid used by one potential contractor are listed in Section 2.1.2.2.6. Upon closure of the mines, PDSI would be required to properly remove and dispose of hazardous materials from the mine sites per the APP and reclamation requirements.

The transport, use, and storage of hazardous materials for the Project would increase the potential risk for adverse impacts associated with a spill or discharge of hazardous materials. The environmental effects of a release would depend on the substance, quantity, timing, and location of the release and could range from a minor spill of diesel fuel on site to a severe spill of sulfuric acid or fuel on public roads or bridges during transport to the mine site. PDSI would develop a Spill Prevention Control and Countermeasures (SPCC) Plan to address requirements for preventing accidental spills and developing procedures to be followed in the event of a spill. PDSI would also be required to meet the toxic releases inventory report requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and Section 6607 of the Pollution Prevention Act of 1990. These laws require that PDSI annually report toxic releases (including amounts) should any statutory thresholds be exceeded (T. Crawford, EPA, pers. comm.).

As described in Section 3.2.1.9, PDSI initiated and completed voluntary clean-up and stormwater management activities at the existing San Juan pit. These activities included general cleanup of debris, as well as construction of a stormwater diversion and installation of a stormwater evaporation pond. ADEQ has determined that these improvements at San Juan would be subject to the Aquifer Protection Permit review process and would be treated as a new facility.

4.3.1.9.2 Partial Backfill Alternative. Impacts of this alternative would be identical to those of the Proposed Action.

4.3.1.9.3 No Action Alternative. This alternative would not affect or result in the use of hazardous materials on public lands.

4.3.2 Physical Resources, Including Waters of the U.S.

4.3.2.1 Climate

4.3.2.1.1 Proposed Action Alternative. This alternative would not affect climate on a regional scale, but could alter local wind patterns on the mining site. Prevailing weather patterns for the Safford Valley are governed by larger regional and global geographic factors beyond those potentially affected by the Project and would not be affected by development of the Proposed Action in any measurable way. Winds generally follow local topography and flow parallel to major valleys (Class One Technical Services 1997). On a very localized (or microclimatic) scale, wind patterns in and around the mine property would respond directly to changes in local topography caused by development of the open pit mines, stockpiles, leach pad, and other facilities. These microclimatic changes, however, are not expected to be noticeable in the natural and human environment beyond the project area.

4.3.2.1.2 Partial Backfill Alternative. Similar to the Proposed Action, winds in and around the mine property at a very localized scale would respond directly to changes in local topography that would result from development of open pit mine operations and partial backfill of the San Juan Pit. While the reduced height of the development rock stockpiles would be expected to result in different microclimatic effects, these

extremely localized changes would not likely be discernible or noticeable on the human or natural environment.

4.3.2.1.3 No Action Alternative. This alternative would have no impact on the existing climate in the region containing the project region.

4.3.2.2 Air Quality

4.3.2.2.1 Proposed Action Alternative. The Project is not expected to emit air pollutants in excess of state or national standards. Arizona's State Implementation Plan (SIP) sets forth the measures to be used to attain the National Ambient Air Quality Standards (NAAQS) in designated non-attainment areas for six criteria air pollutants: particulate matter (PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and lead (Pb). Because the project area lies in an attainment area for all six pollutants, no existing non-attainment SIP requirements are applicable to the Project (J. Gibbs, ADEQ, pers. comm.).

Potential impacts to air quality from the Proposed Action alternative were assessed by modeling the emissions levels of the four criteria pollutants, PM_{10}, NO_2, SO_2, and CO, that would reasonably be expected to emanate from the mining activity (Class One Technical Services 1997). Sulfuric acid (H_2SO_4) mist, which appears on Arizona's Air Quality Guideline Program list but is not a criteria pollutant, was also modeled. Volatile organic compounds (VOCs), also an expected emission of the Project, were not modeled because NAAQS have not been established for them (ibid.). Although VOC is a precursor to ozone formation, the nature of ozone formation is such that modeling is more appropriately done on a regional scale. ADEQ's practice is to conduct ozone modeling only in large-scale, non-attainment areas like Maricopa County (B. Kuby, A. Hofmeister, ADEQ, pers.comm.).

The emissions sources associated with proposed mining and mining-related activities in the project area would consist primarily of fugitive sources (i.e., area sources with emissions that cannot reasonably be directed through a stack, vent, or functionally equivalent opening). Other sources of emissions would be vehicular tailpipes and point sources (sources with emissions that can reasonably be directed through a stack, vent, or functionally equivalent opening). Fugitive emissions include PM_{10} (dust) from mobile equipment traffic on dirt roads, drilling, blasting, truck loading and unloading, crushing and materials handling, and wind erosion of exposed and disturbed soil. The MPO provides for dust control at the primary crusher plant, secondary crushing and screening plant, coarse ore surge pile, and fine ore surge pile. Atomized water spray systems with fog nozzles and water-wetting systems would be used at these facilities to suppress dust, and air pulse dust collection systems would be used to filter dust-laden air. Throughout construction and operations, water trucks would systematically suppress dust on haul roads and unpaved primary access roads.

NO_x, CO, and SO_2 would be generated as fugitive emissions from blasting, in tailpipe emissions from mobile equipment, and from point source emissions from the boilers at the SX/EW facility. Sulfuric acid mist would be emitted from electrowinning operations at the SX/EW tankhouse. VOCs would be generated by fugitive and point source emissions from the boilers, SX/EW mixer-settler tanks, and the diesel storage tank (ibid.). Acid mist control methods being evaluated by PDSI include heat retention beads and balls, surfactants, water foggers, and cell wipers. Essentially, these methods either retard the release of acid mist from electrolyte within the electrowinning cell or work to contain acid mist above the cell. Emissions of VOCs during the solution extraction process would be minimized through engineering design and diluent selection for low vapor pressure. Boiler combustion gasses would be minimized through use of clean-burning fuels, such as propane and/or natural gas.

The criteria pollutants were modeled at the Project's "process boundary"[4] (see Figure 3-4) and at four special receptor sites: the City of Safford, the San Carlos Apache Reservation boundary, at the Galiuro Wilderness west of the project area, and at the Gila Wilderness in New Mexico. Both wildernesses are Class I airsheds that lie within 100 km of the project area. The modeling results at the process boundary are summarized in Table 4-7; the modeling results at the four special receptor sites beyond the process boundary are summarized in Table 4-8. Modeling results showed that none of the assessed pollutants, when modeled results were added to ambient concentrations, would exceed NAAQS or guidelines within any 1-hour, 8-hour, 24-hour, or annual period at or beyond the process boundary (Class One Technical Services 1997).

Table 4-7. Summary of Air Quality Model Results at the Process Boundary

Pollutant	Averaging period	Modeled concentration ($\mu g/m^3$)	Ambient concentration* ($\mu g/m^3$)	Additive Concentration (modeled + ambient) ($\mu g/m^3$)	Standard or guideline ($\mu g/m^3$)
PM_{10}	24-hour	34.3	25.9	60.2	150.0
PM_{10}	Annual	4.5	12.1	16.6	50.0
NO_2	Annual	45.7	negligible	45.7	100.0
SO_2	24-hour	108.6	negligible	108.6	365.0
SO_2	Annual	9.1	negligible	9.1	80.0
CO	1-hour	2,009.6	negligible	2009.6	40,000.0
CO	8-hour	617.6	negligible	617.6	10,000.0
H_2SO_4 mist	1-hour	14.9	negligible	14.9	22.5
H_2SO_4 mist	24-hour	0.8	negligible	0.8	7.5

* ambient PM_{10} concentration data from particulate monitoring station at Montezuma Castle
Source: Class One Technical Services 1997, Table 4.0-1.

While the Proposed Action alternative would result in an increase in the ambient concentrations of criteria pollutants, no standards would be exceeded and this alternative is not expected to have a significant adverse effect on the air quality or visibility of any Class I airsheds within 100 km of the project area. Visibility analysis of plume visual impacts associated with proposed mining and mining-related activities was conducted for the two Class I airsheds within 100 kilometers (km), or about 60 miles, of the process boundary: the Galiuro Wilderness southwest of the project area and the Gila Wilderness east of the project area in New Mexico (see Figure 3-5). This analysis was performed using the EPA VISCREEN model to assess plume impact on visibility. Plume visual impacts are a function of atmospheric turbulence (wind speed and direction); local terrain; and the location, buoyancy, particle size, and frequency of emissions. The analysis is influenced and complicated by several factors, such as the influence on plume transport meteorology of intervening terrain between the Project and the area being assessed for visibility impacts.

[4] ADEQ policy for air permitting requires the delineation of a process boundary. The process boundary does not necessarily correspond to the facility property boundary, as defined by the private lands and lands controlled by claims, leases, permits, and easements. The purpose of the process boundary is to identify areas where public access is not reasonably limited; these areas are considered to be outside of the process boundary. Public exposure to airborne pollutants is assumed to occur only in areas where public access is not reasonably limited (Class One Technical Services 1997).

Table 4-8. Summary of Air Quality Model Results at the Four Special Receptor Sites

Pollutant	Averaging period	Ambient concentration (µg/m³)	Modeled Additive Concentrations (ambient + modeled) (µg/m³)				Standard or guideline (µg/m³)
			City of Safford	*San Carlos Apache Reservation*	*Galiuro Wilderness*	*Gila Wilderness*	
PM_{10}	24-hour	25.9	31.3	35.8	26.3	26.1	150.0
PM_{10}	Annual	12.1	12.3	12.4	12.1	12.1	50.0
NO_2	Annual	negligible	3.00	2.14	0.02	0.05	100.0
SO_2	24-hour	negligible	12.33	18.30	1.63	0.15	365.0
SO_2	Annual	negligible	0.44	0.42	0.04	0.01	80.0
CO	1-hour	negligible	389.41	553.72	65.02	3.51	40,000.0
CO	8-hour	negligible	64.98	69.22	9.64	0.44	10,000.0

Source: Class One Technical Services 1997

The VISCREEN model is based on anticipated emissions, which for the Project, primarily consist of fugitive dust and vehicle tailpipe emissions. A level-2 analysis, which is more complete than a screening level-1 analysis, was performed for the Galiuro Wilderness (Class I airshed) using on-site meteorological data (Class One Technical Services 1997).

For the Galiuro Wilderness, whose closest boundary to the Project is approximately 67 km to the southwest, the potential for generation of a visual plume and the frequency of occurrence of conditions which would cause impacts to visibility are extremely low and demonstrate that no perceptible, coherent plume visual impacts would occur for views within the wilderness (Class One Technical Services 1997). For the Gila Wilderness, the modeled values for plume contrast and the color difference between the plume and the background were well below screening level-1 criteria, indicating that no impacts to visibility in the wilderness are anticipated as a result of the Project's emissions. No conformity analysis was required given these screening level-1 results.

4.3.2.2.2 Partial Backfill Alternative. The primary difference between this alternative and the Proposed Action is the backfilling of 60 to 80 million tons of development rock into the San Juan pit. Permanent sources of emissions, such as conveyors and some processing facilities would be identical to the Proposed Action. Mobile emissions sources, such as haul trucks and support vehicles would follow slightly different haulage routes after Year 10 of the Project for the proposed backfilling of the San Juan pit. Truck loading and unloading associated with backfilling development rock in the San Juan pit would be a source of PM_{10}. While the PM_{10} and tailpipe emissions would be generated from slightly different *locations* than those of the Proposed Action, the total *quantity* of emissions (tons per year) would not be measurably different. Therefore, no emissions of criteria pollutants affecting air quality are expected to exceed standards or guidelines within any 1-hour, 8-hour, 24-hour, or annual period at or beyond the process boundary, including the City of Safford, San Carlos Apache Reservation boundary, and the Galiuro and Gila wildernesses, based on VISCREEN modeling results (Class One Technical Services 1997).

For Class I airsheds within 100 km of the Project, factors affecting plume visual impacts such as atmospheric turbulence (wind speed and direction); local terrain; and the location, buoyancy, particle size, and frequency of emissions, are expected to be identical to the Proposed Action alternative. Therefore, the results of

visibility analysis described under the Proposed Action for the Galiuro and Gila wildernesses would be identical for this alternative.

4.3.2.2.3 No Action Alternative. The No Action alternative would not change existing conditions for air quality, criteria pollutants, or visibility in Class I airsheds.

4.3.2.3 Geology

4.3.2.3.1 Proposed Action Alternative. This alternative would impact some of the locatable and salable mineral resources, the geological resources of primary concern, within the nearly 17,000 acres of public lands in the project area. As part of baseline data collection, a BLM-approved contractor evaluated locatable and salable mineral resources and found that high mineral potential for copper or related mineralization occurs on only about 265 acres or 1.6 percent of the total, specifically on parts of parcels H, P, Q, I1, and O (see Figure 3-8). These are areas that would be impacted by development of the San Juan pit under the Proposed Action alternative (ibid.). The remaining public lands, approximately 16,735 acres or 98.4 percent, have low mineral potential for either open-pit or underground deposits and are not proposed for mining development. None of the lands contain 1) moderate or high mineral potential for all other metallic minerals, including placer gold; 2) known commercial quantities of non-metallic and industrial mineral resources; 3) prospectively valuable coal, oil, gas, sodium, or potassium resources; or 4) moderate or high potential for accumulation of uranium or thorium (ibid.). The known sulfide orebody underlying the Dos Pobres pit on PD's private lands or future access to develop it would not be impacted by the Project because of the planned 1300-foot setback around the pit.

For salable minerals, the Watson Wash aggregate borrow area (roughly 1/3 lies on public lands) and the existing aggregate source (entirely on public lands) located immediately downstream of the proposed leach pad would be used to provide riprap, sand, and gravels necessary for construction of stormwater channel protection, haul roads, roadbeds, and other facilities. These direct impacts to salable materials on the public lands would be long term.

4.3.2.3.2 Partial Backfill Alternative. The proposed backfilling of development rock in the San Juan pit would not preclude access to any currently known, economically viable reserves of metallic or non-metallic resources because such reserves would have been removed from the western portion of San Juan pit before backfilling begins in Year 10 of the Project. However, backfilling permanently removes the potential to access any economic ore deposits in that portion of the San Juan pit that may be identified as future technology or the price of copper change. Like the Proposed Action, the Dos Pobres setback under this alternative has been designed to accommodate potential future development of the geological mineral resources of the Dos Pobres sulfide orebody.

4.3.2.3.3 No Action Alternative. This alternative would not affect existing mineral resources in the project area.

4.3.2.4 Soils

4.3.2.4.1 Proposed Action Alternative. Based upon SCS mapping of the project area (SCS 1981), direct impacts are expected to the soil complexes associated with the upper alluvial fan terraces, ephemeral washbeds and floodplains, and rocky upper slopes. All of these soil complexes are generally characterized as poor, low productivity soils. To the extent possible, soils would be stockpiled for reclamation along with other growth medium (PDSI 1997). Implementation of stormwater control measures and revegetation programs outlined in the MPO would limit off-site erosion potential. On-site erosion would be controlled in a manner consistent with safety and operational requirements. During construction and operations, dust

suppression by watering would help control soil loss by wind erosion. Stormwater management programs, closure plans under the APP, and BLM reclamation regulations would provide protection for downstream aquatic resources in the Gila River from the effects of long-term soil erosion. Losses of soil productivity, however poor, would occur in areas not subject to active reclamation programs, such as the pit sites, building pads, ponds, and support infrastructures such as roads and powerlines. These long-term losses would continue until natural successional processes resulted in the re-establishment of vegetation and productive soil profiles.

4.3.2.4.2 Partial Backfill Alternative. This alternative would result in direct and indirect impacts to soils that are identical to those described for the Proposed Action alternative.

4.3.2.4.3 No Action Alternative. As no mining or surface disturbing activities would occur under this alternative, soils or sediment yield of the project area would not be impacted by this alternative.

4.3.2.5 Groundwater

4.3.2.5.1 Groundwater Quantity.

- **Proposed Action Alternative.** Groundwater pumping and stormwater diversions at the Dos Pobres/San Juan Project would impact groundwater elevations in the area for an extended period (over 500 years) and, if unmitigated, would likely reduce the amount of surface water flowing in the Gila River by a relatively small amount (35.4 af/yr at year 416).

  Groundwater Model Development. In conjunction with BLM hydrologists, Dames & Moore (1997b, 1997d, 1997e, 1997g, 1996b) prepared a groundwater model to evaluate the potential impact of the proposed Dos Pobres/San Juan Project on the groundwater and surface water regimes near Safford. The purpose of the model was to predict what impact, if any, there may be on regional groundwater flow from development of the proposed open pit mines and groundwater production wells. Of particular interest was the potential impact to surface flows in the Gila River approximately eight miles south of the proposed production well field, which is discussed in Section 4.3.2.6.1, Surface Water Quantity.

  The analysis of potential mine-induced groundwater impacts was accomplished through the use of a computer simulation (model) of the regional groundwater system. In the computer model, the analyst inputs numeric information that describes the regional hydrologic characteristics within the model domain. The model then simulates regional movement and storage of groundwater. Once a model of the system has been calibrated (i.e., adequately describes known behaviors of the system), the model is then used to predict the response of the groundwater system that is likely to result from development of mine pits and groundwater pumping to support mine operations.

  The model represents hydrogeologists' current understanding of the regional groundwater system and is but one of many unique solutions that match computed and observed values with equal precision. The model integrates various elements of a complex hydrogeologic system and is the best method available to describe and predict the behavior of the system under the Proposed Action. However, since the model is not the "real world," monitoring of the actual system response, comparing that response to the model's predictions, and adjusting mitigation accordingly is an integral component of groundwater resources and Indian trust resources management. This "model, monitor, and mitigate" approach is described in greater detail in Appendix F. The modeling effort and model predictions are described below.

The model was developed with a total of 226,304 calculation cells, covering approximately 478 square miles extending north from the Gila Mountains to south of the Gila River and east from about the confluence of the Gila River and Bonita Creek to Eden in the west (Figure 4-5). The groundwater model computer programs MODFLOW (USGS 1983, 1996), ZONE BUDGET (Harbaugh 1990) and Visual Modflow (Waterloo Hydrologic Software 1995) were used in this analysis (see Dames & Moore 1997a - 1997e, 1997g, 1997h).

The model domain incorporates a complex hydrogeologic setting in thick bedded sedimentary deposits in the Safford Valley, and faulted and fractured andesitic and basaltic volcanic rocks at the mine property and in the Gila Mountains. Subsurface data developed by PDSI and other mining companies and interpretations by several hydrologists, hydrogeologists, and geologists from the USGS were used to define the hydrogeologic system. The hydrogeologic system is depicted in Figure 3-9 in Chapter 3. A representative cross section through the model showing structure and input hydraulic parameters is shown on Figure 4-6. Both Bonita Creek and the Gila River flows were simulated with respect to their interactions with groundwater levels immediately adjacent to the river. Recharge to volcanic rocks and to the Lower Basin Fill was simulated as mountain-front recharge and as areal recharge over the Gila Mountains. Recharge rates and area distribution were developed in cooperation with BLM hydrologists.

In order to achieve an acceptable steady-state calibration, most recharge to the model was applied as mountain-front recharge in areas adjacent to the mountains. A much smaller amount of areal recharge was also applied over the Gila Mountains. Groundwater from the San Simon basin and from the Pinaleño and Peloncillo mountains enters the model along the model boundaries. The amounts of flow from these areas were derived from published USGS estimates and input from BLM. Irrigation pumping was simulated by an average withdrawal of water from irrigated areas of the model; pumping from individual irrigation production wells was not simulated. The rate of irrigation withdrawal is estimated as the difference between the consumptive use by crops, estimated by BLM to be 153,000 af/yr, and total diversions from the Gila River, estimated by BLM to be 100,000 af/yr (H. West, BLM, pers. comm.). Groundwater discharge from the model domain was applied at its western end near Eden to achieve an appropriate balance between inflow and outflow to the model comparable to published USGS estimates of flow through the Safford Valley near Calva. These estimated outflows were developed in cooperation with BLM hydrologists. Model boundary conditions are depicted on Figure 4-7.

A steady-state model was developed that simulates the current groundwater flow pattern throughout the model domain. The steady-state model was calibrated using water levels measured in wells in the model domain for which current and historical data were available by comparing predicted and measured well water levels. The water balance for the model is shown on Figure 4-8. A scatter plot of observed versus simulated water levels is shown on Figure 4-9. The correlation coefficient for all data is 0.99, where 1.00 is a perfect correlation (Dames & Moore 1997b). A total of about 500 observations of water levels was used to calibrate the model. In addition, the model was calibrated using BLM estimates of baseflow in Bonita Creek and in the Gila River. The predicted steady-state water levels are shown on Figure 4-10.

When the calibration statistics of the steady-state model reached acceptable limits, a transient model was developed to simulate large-scale pumping tests conducted at the project site in 1996. The model's simulated drawdown from the pumping wells and nearby monitor wells was compared to observed drawdown from the same wells (Figure 4-11).

When the results were found to match within acceptable limits, as defined by BLM, the transient model was considered calibrated.

The calibrated transient model was then used to simulate groundwater withdrawal from production wells in the vicinity of the proposed mine and groundwater withdrawn from open pits. Production of groundwater was simulated to increase to a maximum of 5,000 gpm (8,065 af/yr) for the 16-year life of the Project. Predicted drawdown of the water table at 16 years of mining is shown in Figure 4-12.

Potential Impacts on Groundwater Surface Elevations. To predict the long-term impact of the development of open pits and groundwater pumping on the groundwater surface elevation in the model domain, the cone of depression was simulated for a period of about 500 years after closure of the mine. The model results show a maximum drawdown of 349 feet after about 16 years centered in the San Juan pit, with the drawdown cone as defined by the one-foot contour line not reaching either the Gila River or Bonita Creek (Dames & Moore 1997g) (Figure 4-13). By extrapolation, the model also predicts the approximately 40-foot contour of the cone of depression reaching the southern boundary of the San Carlos Apache Reservation (Figure 4-12). This predicted impact would be monitored as part of the water resources mitigation and monitoring plan (Appendix F) submitted for this Project. Groundwater wells located between the Project and the San Carlos Apache Reservation boundary and Bonita Creek would be monitored to determine if the groundwater surface elevation is responding to groundwater pumping in the manner predicted by the model.

Potential Impacts on Gila River Flow. The model was also used to predict any potential impact of groundwater pumping and the mine pits on Gila River flow by calculating changes in groundwater flow to/from the river as a function of time. Over a 500-year simulation time, the maximum reduction in water flow to the Gila River from groundwater as projected by the model is estimated to be approximately 35.4 af/yr at year 416 (Dames & Moore 1997g).

This effect predicted by the model is an estimate based upon the best available information. Calibration of the model was accomplished by trial and error adjustment of aquifer parameters within the limits of values reported in the literature for these and/or similar units. In addition, the boundary fluxes in the model were also constrained by data from USGS streamflow gages or from published estimates of subsurface flows both into and out of the model domain. While the model calibration resulted in acceptable matches of computed and observed water levels in wells, the present model is but one of many unique solutions that might match computed and observed values with equal precision. Implementation of the monitoring program outlined in Appendix F will provide ongoing evaluation of the model's predicted effects to the Gila River. If the changes in water levels in monitoring wells deviate in excess of established criteria from the model's predicted changes, the model will be recalibrated to bring the projected levels and gradients within those bounds. After recalibration, the model would be rerun to determine if projected river flow impacts from mining warrant changes in the implemented mitigation measures.

Potential Impacts on Area Springs. Only DP Seep would be directly impacted by proposed mining operations as it lies within the footprint of the Dos Pobres open pit on PD land. Bryce, Hackberry, Cottonwood, and Walnut springs, all upgradient (north) of the mine pits, and separated from the pits and the area of project pumping by the Butte Fault, are not expected to be impacted by the Project's predicted drawdown of groundwater (R. Mac Nish, U of A, pers. comm. 1998).

Potential Impacts on the Watson Wash Artesian Well. The groundwater model predicts that the Watson Wash artesian well, located southwest of the project area, could be impacted by Project operations (Dames & Moore 1998d). A maximum drawdown in wellhead pressure of 0.47 foot is anticipated by year 126 of the model run. Potential impacts to this artesian well would be monitored at the wellhead and between the well and the Project well field. Mitigation, if predicted impacts occur, would be achieved by reducing the height of the well discharge pipe by the amount of drawdown in measured wellhead pressure. If impacts of greater magnitude were observed in the "early warning" wells located between the well field and the Watson Wash artesian well, alternative mitigation would be developed and implemented before actual impact at the well. No impacts are therefore expected to recreational uses or wildlife habitat at Watson Wash artesian well

- **Partial Backfill Alternative.** The impacts to groundwater quantity in the region resulting from implementation of the Partial Backfill alternative are expected to be identical to those described for the Proposed Action as the water demand and supply are identical for this alternative.

- **No Action Alternative.** This alternative would not affect existing groundwater quantity since no mining, hence no pumping, would be authorized.

4.3.2.5.2 Groundwater Quality.

- **Proposed Action Alternative.** Because of groundwater protection measures designed to BADCT standards—such as the liner systems for the leach pad, PLS excess solution ponds, and stormwater impoundment—the Proposed Action alternative is not expected to impact existing groundwater quality at or beyond the points of compliance identified in PDSI's APP permit application. APP closure requirements include permanent strategies to control run-on, runoff, and infiltration; therefore, post-Project groundwater quality is expected to continue to meet drinking water quality standards as well.

  Under Arizona's Environmental Quality Act of 1986, PDSI must obtain an Aquifer Protection Program (APP) permit to implement mining activities. The APP permit would cover all potentially discharging facilities, such as the leach pad, stormwater impoundment, PLS excess solution ponds, truck wash, and the existing evaporation pond at San Juan. PDSI anticipates submitting an application for the APP permit to the Arizona Department of Environmental Quality (ADEQ) in the summer of 1998. The APP process provides opportunities for public review and requires PDSI to demonstrate compliance with Best Available Demonstrated Control Technology (BADCT) design standards for potentially discharging facilities. APP requirements stipulate that at applicable points of compliance, groundwater quality must meet state aquifer water quality standards, which, in Arizona, are equivalent to federal maximum contaminant levels (mcl) for drinking water standards set by EPA. The points of compliance must be located so as to ensure the protection of all current and reasonably foreseeable future uses of the aquifer by the permittee.

- **Partial Backfill Alternative.** Under this alternative, the APP requirements and potentially discharging facilities are identical to those identified for the Proposed Action alternative; therefore, post-Project groundwater quality is expected to continue to meet drinking water quality standards.

- **No Action Alternative.** As there would be no mining activities or potentially discharging facilities permitted under this alternative, no impacts would occur to existing groundwater quality.

4.3.2.6 Surface Water

4.3.2.6.1 Surface Water Quantity.

Proposed Action Alternative. The focus of surface water quantity analysis is the Gila River, Bonita Creek (as the City of Safford's primary drinking water source), the ephemeral drainages within the project area, and the artesian well at Watson Wash. Long-term, direct, potential impacts to surface flows in the Gila River could result from two sources: 1) predicted drawdown in the regional groundwater flow system (Section 4.3.1.5.1) as a result of Project groundwater pumping; and 2) reduced volume of surface water discharged from drainages tributary to the Gila River as a result of surface diversions and other environmental protection measures for surface water quality.
In summary, projected annual impacts to surface flows in the Gila River as a result of groundwater pumping are expected to be extremely small relative to its average annual flows. This is attributed to the relatively short duration (16 years) of pumping and the relatively small amount of water being pumped (peak rate of approximately 5,000 gpm or 8,065 af/yr) versus the large volume of water flowing through the regional groundwater system (MacNish 1998). These impacts, which are discussed further below, would be mitigated as described in Section 4.9 and in Appendix F.

The maximum predicted impact to the Gila River from impacts to groundwater flow over the 16-year life of the Project would be approximately 4.5 af/yr (0.006 cfs) (Dames & Moore 1997b). The modeled impact is projected to increase steadily from the end of mining to reach about 26 af/yr (0.04 cfs) in about 100 years, and then increase more gradually, reaching about 35 af/yr (0.48 cfs) by year 300. The maximum impact of 35.4 af/yr is projected to occur at 416 years, and impacts continue at levels exceeding 35 af/yr through the 500-year period of the model projection (Figure 4-14) (ibid.). These predictions are based upon best currently available groundwater data and do not account for changes in climate, population growth, water use, and other land uses that may affect the regional groundwater system.

In addition to groundwater pumping, stormwater management is expected to affect surface water flows of the Gila River. As a result of the Project's upstream diversions and other stormwater management measures designed to meet PDSI's section 402 (NPDES) permit requirements, annual runoff to the Gila River is expected to be reduced by approximately 94 af/yr (see Table 4-9; Dames & Moore 1998e). The total expected reduction in flow results from both a reduction in incidental sheet flow before it collects in channels and channel flows. In accordance with water rights laws, the portion of incidental sheet flow captured at the leach pad, Dos Pobres and San Juan pits, East and West development rock stockpiles, stormwater impoundment, SX/EW plant, soil stockpiles, and aggregate and compactible soils borrow sources, is not appropriable (Dames & Moore 1998c). As far as impacts to water rights, the total reduction in flow is only 40 af/yr. Prior to implementation of the mitigation measures described in Appendix F, the total predicted impact to surface flows in the Gila River from both groundwater pumping and surface water management is estimated to be approximately 129.4 af/yr, about 0.046 percent of its average annual flow (283,600 af/yr for water years 1930 - 1995) and 0.62 percent of its lowest annual mean flow (20,817 af/yr in 1956) as measured at Calva downstream of the project area (USGS 1996).

Table 4-9. Estimated Change in Average Annual Runoff to the Gila River as a Result of the Proposed Action Alternative

Wash	Existing Runoff (af/yr)	Estimated Runoff under Proposed Action Alternative (af/yr)	Net Change (af/yr)	Percent change
Butler Wash	264	289	25	9.5%
Watson Wash	137	68	(69)	(50.4%)
Talley Wash	19	85	(34)	(28.6%)
Cottonwood/Peterson Wash	252	238	(14)	(5.6%)
Lone Star	130	128	(2)	(1.5%)
Wilson Wash	80	80	0.0	0%
TOTAL	**982**	**898**	**(94)**	**(10.4%)**

Source: Dames & Moore 1998f

The reduced river flow caused by the effects of the cone of depression, which both captures groundwater that otherwise would have discharged to the river and induces more water to flow towards the cone and away from the river, may be viewed in two ways. In terms of annual rates, the predicted maximum rate of 35.4 af/yr occurs at year 416 and is only a small fraction of the average annual flow of the Gila River. Over time, the total volume of water captured from the Gila River is expected to approach the total volume of water to be pumped by the mine (MacNish 1998), about 68,347 af. According to model predictions, only about 11 percent of the mines' total pumpage would be captured from the Gila River in the first 500 years after mining, so the effects of that pumpage are expected to extend a few thousand years into the future (ibid.). However, refinement of the model inputs during actual pumping and monitoring may cause these predicted values to increase or decrease.

In contrast, Bonita Creek flows are not expected to be measurably impacted by groundwater pumping. The same model used to predict the Gila River impact predicts a maximum net reduction in Bonita Creek flows of less than one af/yr, a value that is at or below the accuracy of the model (Dames & Moore 1997h). This peak reduction would occur sometime around Year 90 after Project initiation. Figure 4-14 shows the predicted changes in surface flow from the Gila River and Bonita Creek over a 500-year simulation period as estimated using the model described above. This projected minor reduction in flow would not affect the capacity of the City of Safford's current drinking water system, which is currently operating near maximum (H. West, BLM, pers. Comm.).

The modeled effects of the predicted cone of depression on the artesian well in Watson Wash show a maximum drawdown of 0.47 feet at year 126 (Dames & Moore 1998d), a value that is at or below the level of accuracy of the model. This well would be monitored as part of the proposed water resources mitigation plan; should monitoring indicate that projected drawdown is reducing flow at the well, then the well height would be reduced by the amount of the drop in well head pressure.

- **Partial Backfill Alternative.** This alternative is expected to result in impacts to surface water quantity that are identical to those described under the Proposed Action alternative.

- **No Action Alternative.** With no mining permitted under this alternative, no effects to existing surface water quantity of the Gila River, Bonita Creek, or drainages on the project area are expected.

4.3.2.6.2 Surface Water Quality.

- **Proposed Action Alternative.** Surface water quality off the mine site is not expected to be adversely affected under the Proposed Action alternative because on-site and off-site surface water quality would be regulated by Sections 401 (State Water Quality Certification), 402 (NPDES), and 404 of the Clean Water Act (CWA). Off-site drainage would be diverted around the Project by a series of stormwater diversion channels, thereby preventing stormwater from contacting mine facilities. Stormwater that falls onto mine facilities and the project site would be retained on the mine site and not discharged as part of Section 402 CWA compliance. Stormwater facilities have been designed to retain the 100-year, 24-hour event, including a 24-hour power outage, a criterion that meets or exceeds BADCT standards. Stormwater retained on-site would become entrained in the process make-up water system.

  PD is required to develop a spill and pollution prevention plan to minimize the probability of releasing process solutions in the environment during operations and to provide for the rapid detection and control of process solution seepage or accidental spill. The potential for a surface release of process solutions or hazardous materials does exist, however unlikely given the design of the stormwater impoundment, and such a release could possibly affect surface water quality of the ephemeral drainages if such an event occurred during storm event. The alkaline nature of the soils in the area would likely neutralize a release of PLS or sulfuric acid and given the approximately five-mile distance to perennial water (Gila River), it unlikely that a such release would cause a water quality exceedance in the river.

  One of the potential impacts to surface water quality from the Proposed Action is changes in sediment transport characteristics of some drainages as a result of the Project's stormwater management program. These impacts result from increased scour associated with diversions and detention of sediment in detention/retention basins. A sediment transport model (HEC-6) was constructed for drainages in which there was a potential for measurable increased channel scour as a result of the post-mine conditions (Dames & Moore 1998c). The model was used to estimate the extent of downstream scour as a result of increased flow velocities and shear forces in drainages with increased flows: E Wash, an unnamed tributary of Coyote Wash; Q Wash, an unnamed tributary of Peterson Wash; and Cottonwood Wash (see Figure 2-1). The model results for these three drainages show that equilibrium for sediment transport is re-established downstream at distances of about one mile for E Wash, 0.2 miles for Q Wash, and 1.7 miles for Cottonwood Wash from their respective diversion outfalls (see Figure 4-15). All of these equilibrium points are located within the mine site boundary; therefore, the effects of scouring are not expected to extend off-site (i.e., no scour effects on private or state lands south of the project area or at the Gila River) (Dames & Moore 1998c).

  To estimate the impacts to sediment yield from the five largest washes in the project area, Dames & Moore (1996a) used the Pacific Southwest Inter-Agency Committee (PSIAC) method. Input parameters in this model include geology, soils, climate, runoff, topography, ground cover, land use, upland erosion, and channel erosion and transport. Based on the results of the model, the proposed stormwater management activities under the Proposed Action alternative are estimated to reduce the average annual sediment yield in some drainages by approximately nine percent (Table 4-10) of the existing yield, which could increase the potential for channel erosion (scour) during high flow events.

Table 4-10. Impacts to Average Annual Sediment Yield for Five Washes in the Project Area as a Result of the Proposed Action Alternative

Wash	Existing Sediment Yield (af/yr)	Estimated Sediment Yield for the Proposed Action* (af/yr)	Net Change (af/yr)	Percent Change
Butler Wash	0.9	0.9	0.0	0%
Watson Wash	2.9	2.7	(0.2)	-7%
Talley Wash	1.3	0.9	(0.4)	-31%
Cottonwood/Peterson Wash	1.5	0.9	(0.6)	-40%
Wilson Wash	3.0	3.3	0.3	10%
TOTAL	**9.6**	**8.7**	**(0.9)**	**-9%**

* Dames & Moore (1996a) evaluated average annual sediment yield under "post-project alternatives" A, B, C, and D. Alternative B was used as a proxy for the Proposed Action. Alternative C was assumed to be the Partial Backfill Alternative.

- **Partial Backfill Alternative.** Surface water quality off the mine site is not expected to be affected under the Partial Backfill alternative as on-site and off-site surface water quality would be regulated by Sections 401 (State Water Quality Certification), 402 (NPDES), and 404 of the Clean Water Act. Under the Partial Backfill alternative, the diversion of flows into E Wash, Cottonwood Wash, and Q Wash would result in impacts to potential bed sediment erosion identical to those described under the Proposed Action alternative. Like the Proposed Action, the impacts of scour are not likely to be discernible off the mine site or at the Gila River (Dames & Moore 1998c).

  To estimate the impacts to sediment yield from the five largest washes in the project area, Dames and Moore (1996a) used the Pacific Southwest Inter-Agency Committee (PSIAC) method. Input parameters in this model include: geology, soils, climate, runoff, topography, ground cover, land use, upland erosion, and channel erosion and transport. Based on the results of the model, the drainage modifications under the Partial Backfill alternative are identical to those proposed for the Proposed Action and are also estimated to reduce average annual sediment yield by approximately nine percent (Table 4-10).

- **No Action Alternative.** This alternative would not affect existing surface water quality of the project area, as no surface disturbance activities would be permitted under this alternative.

4.3.2.6.3 Pit Lakes.

- **Proposed Action Alternative.** During mining operations, precipitation, pit wall runoff, and groundwater entering the pits would be pumped out for use in the milling process. Once mining is completed and the pits are no longer dewatered, a lake is expected to form in each pit. Mining the San Juan deposit would eliminate the existing pit lake, a positive impact because the pit lake that would form in the new San Juan pit at the close of operations would likely have much better water quality than the current pit lake (Water Management Consultants 1997).

  After closure, the Project's stormwater diversion structures would continue to divert surface flows from entering the San Juan and Dos Pobres pits. Proposed structures that would affect the water quality of future pit lakes and their purposes are summarized below (Dames & Moore 1997c):

- West Diversion Channel to E Wash (see Figures 2-8 and 2-9). This diversion is designed to reduce surface flow into the Dos Pobres pit and ponding against the West development rock stockpile.

- South Diversion Channel to Q Wash (see Figure 2-12). This diversion is designed to reduce local flows into the San Juan pit.

- Peterson Wash Diversion Channel to Cottonwood Wash (Figure 2-13). This diversion is designed to prevent Peterson Wash flows from entering the San Juan pit.

Water Management Consultants, Inc. (1997, 1998) evaluated the expected conditions in the San Juan and Dos Pobres ultimate pit lakes under the Proposed Action alternative. This evaluation is based upon an estimate of the acid-generating potential of the wall rocks in the pit based on acid-base accounting data, an estimate of the leachate chemistry derived from interaction of simulated rain and rocks expected to occur in the pit walls based upon the results of EPA1312 testing, and predictive modeling of the chemical load of the runoff from the high walls and influent groundwater chemistry (based on the results of the groundwater monitoring program) mixed in proportions defined by the water balance model (ibid.).

Inflows of groundwater into the San Juan pit at a predicted average rate of about 50 gpm are expected to be balanced by evaporation (ibid.). The pit lake would have at a steady-state volume of 190 million cubic feet and the lake level would ultimately stabilize at around 3,450 feet above mean sea level (msl) (see Figure 4-16). Table 4-11 summarizes and Figure 4-17 depicts in graphic form the output from the PHREEQC 40-year simulation for the long-term San Juan pit lake chemistry as compared to Arizona Aquifer Water Quality Standards (AWQS), and BLM Avian receptor standards for Mule Canyon, Nevada. In summary, toxic trace metals, such as chromium, arsenic, selenium, cadmium, beryllium, and mercury are more than an order of magnitude below the AWQS in each case. While the predicted lake water is expected to be slightly alkaline, it is not considered to be a threat to wildlife or the environment (Water Management Consultants 1997).

The same evaluation was done for the Dos Pobres pit lake (Water Management Consultants 1997). The anticipated Dos Pobres pit lake has a steady-state volume of approximately 900 million cubic feet. The lake level is predicted to ultimately stabilize at about 3,150 feet (msl), with a net annual groundwater inflow of about five million cubic feet during the first few years of filling after mine closure (Figure 4-16). Long-term average flow into the pit is expected to be on the order of about 150 gpm. Long-term simulation of pit water quality indicates that given the neutralizing capacity of the exposed rocks, and the slightly alkaline groundwater inflow, the pit lake water would most likely be slightly alkaline, with generally lower concentrations of trace metals than the San Juan pit lake. The PHREEQC model results are summarized and compared to applicable water quality standards in Table 4-11; model results are depicted in Figure 4-17. The Dos Pobres pit lake is not expected to be a threat to groundwater quality or to wildlife (ibid.).

A longer-term screening-level pit lake model (400-year projection) was also prepared by Water Management Consultants, Inc. (1998) using state-of-the-art flow and chemical algorithms to address the potential for pit lake evapoconcentration. As with any model that attempts to predict the future, uncertainty increases as the prediction time extends into the future. This uncertainty arises mainly from the stochastic nature of the climatic variables and long-term changes not included in existing weather simulators, and to a lesser extent, from related processes such as soil-water interaction, net infiltration, and runoff and associated landform changes. A number of conservative assumptions were included in the model in order to overestimate the metal concentrations and make the overall results conservative with respect to BLM receptor benchmarks.

Table 4-11. PHREEQC Average and Maximum Concentrations Projected for the San Juan and Dos Pobres Pit Lakes Compared to Applicable Standards (all concentrations in mg/l, except pH, pe, and ionic strength)

	Average		Maximum			
Chemical	San Juan	Dos Pobres	San Juan	Dos Pobres	AWQS	BLM Benchmark
Fluoride	0.288	0.37	0.310	0.391	4	5.3
Barium	0.138	0.118	0.176	0.118	2	--
Chromium	0.0036	0.0033	0.0039	0.0033	0.10	--
Nickel	0.016	0.014	0.018	0.014	0.10	--
Arsenic	0.00009	0.000004	0.00012	0.000005	0.05	0.94
Lead	0.0003	0.0002	0.0043	0.00002	0.05	--
Selenium	0.003	0.002	0.004	0.002	0.05	0.57
Antimony	0.002	0.002	0.002	0.002	0.006	0.17
Cadmium	0.0026	0.0002	0.000027	0.00025	0.005	0.23
Beryllium	0.00009	0.00002	0.000010	0.0001	0.004	--
Mercury	0.00008	0.00007	0.00008	0.00007	0.002	0.002
Iron	0.0003	0.0004	0.0003	0.0011	--	--
Silver	0.001	0.001	0.002	0.002	--	14
Thallium	0.002	0.002	0.002	0.002	0.002	0.002
Ionic Strength	0.006	0.005	0.007	0.007	--	--
Copper	0.014	0.008	0.016	0.009	--	1.1
Zinc	0.015	0.019	0.017	0.02	--	0.834
Manganese	0.022	0.026	0.036	0.051	--	0.78
Aluminum	0.020	0.017	0.023	0.022	--	21
Magnesium	1.59	8.51	1.75	10.41	--	--
pH	8.03	7.93	8.10	8.07	--	--
pe	8.56	8.65	8.72	9.63	--	--
Calcium	21.11	22.93	23.96	27.58	--	--
Potassium	12.10	4.77	13.33	5.13	--	--
Chloride	19.58	21.03	22.97	26.94	--	--
Sodium	74.87	45.97	86.13	56.21	--	--
Sulfate	108.4	91.43	120.2	115.94	--	--
Bicarbonate	105.7	75.51	123.2	89.52	--	--

Source: Water Management Consultants 1997

The results of the 400-year simulation indicated that predicted concentrations for all constituents remain well below (from one to four orders of magnitude) the corresponding BLM benchmarks except for thallium (ibid). Both nickel and antimony exceed the corresponding AWQS. It should be noted, however, that the assumed concentration for thallium at half the detection limit is equal to the BLM benchmark for that constituent, and there is no BLM suggested benchmark value for nickel.

Although the concentration of some of the constituents appears to increase linearly with time as a result of evapoconcentration, such results could arise from the conservative assumptions imbedded in the model (Water Management Consultants 1998). Increasing TDS and phosphate concentrations due to evapoconcentration could result in precipitation of either apatite or fluorapatite ($Ca_5F(PO_4)_3$), which would likely reduce predicted fluoride and phosphate concentrations in the pit lake. The degree to which warm water observed in some well data in the area may also influence the long-term pit lake chemistry is unknown, but the poor water quality (high TDS) observed in Basin Fill sediments south of the Dos Pobres pit are not expected to provide a significant component of recharge to the pit (Dames & Moore 1998f). About 16 percent of the Dos Pobres pit walls are estimated to be hypogene ore (copper ore with the highest pyrite concentration and therefore the highest acid-generating potential [AGP]). Since this ore type occurs at the bottom of the pit, the time of exposure of the sulfide-bearing rocks to the atmosphere may be minimal since the sulfide rocks would be the last to be mined and the first to be flooded upon completion of mining. This factor, along with the relatively high Acid-Neutralizing Potential (ANP) of other pit wall constituents, effectively limit the AGP of the hypogene ore in the anticipated Dos Pobres pit lake (ibid.).

- **Partial Backfill Alternative.** Under this alternative, the existing San Juan pit lake would also be eliminated and the planned pit would be partially backfilled with 60-80 million tons of development rock, reducing the ultimate pit size to approximately 215 acres. Placement of development rock would occur in the western portion of the pit, at elevations of 3,650 feet above msl or higher. The pit lake is expected to ultimately stabilize at 3,450 feet above msl, 200 feet below the toe of the backfill development rock stockpile. Backfilling would therefore have no impact on the projected pit lake water quality or quantity as described above. As under the Proposed Action alternative, the predicted lake water is expected to be slightly alkaline, but is not expected to be a threat to wildlife or the environment. The expected water quality and quantity of the anticipated pit lake at Dos Pobres is expected to be identical to that described under the Proposed Action alternative.

- **No Action Alternative**. Under this alternative, the existing pit lake at San Juan would remain and no pit lake would be expected to form at Dos Pobres since no further development of that orebody would occur. Over the long-term, the pit lake water quality at San Juan could potentially improve, as clean-up activities already instigated by PDSI included activities to divert poor-quality runoff from old leach stockpiles to an evaporation pond and away from the existing pit. In the very long-term, evapoconcentration of some chemical constituents of the pit lake may also occur, should the rate of evaporation exceed the rate of precipitation and groundwater inflow entering the pit.

4.3.2.6.4 100-year Floodplains.

- **Proposed Action Alternative.** Under the Proposed Action, the hydrologic regime of several washes would be altered by the proposed construction of a series of retention, detention, and diversion structures to reduce run-on into the San Juan and Dos Pobres pits, leach pad, and development rock stockpiles; reduce ponding against stockpiles; and prevent release into surface waters of flows potentially impacted by leaching or mining operations. As summarized in Table 4-12, these structures would result in reduced peak flows in washes from which flows are diverted (F, G, Watson, Talley, Peterson) and increased peak flows in washes which receive diverted flows (E, E1, Q, and Cottonwood).

Table 4-12. Estimated Range of Increases in Surface Water Flow in Nine Washes from the Proposed Action Alternative

Wash	Percent of Pre-Mine Peak Flow
F	26-73
G1	24-77
Watson	33-69
Talley	27-84
Peterson	25-73
E1	134
E	103-135
Cottonwood	137-151
Q	122-180

Source: Dames & Moore 1997c, 1998c.

The FEMA 100-year floodplain delineation for the Gila River in the region of the project area is not expected to change as a result of the Proposed Action. For the washes with increased peak flows, an estimate of the extent of scour was completed by comparing pre- and post-mine flow velocities and shear forces. Conservative estimates of the extent of scour for E, Cottonwood, and Q washes are distances of approximately one mile, 1.7 miles, and 0.2 mile, respectively. The Graham County landfill, located near the confluence of Peterson and Cottonwood washes, is roughly 10 miles (52,800 ft) downstream of the West Diversion Outfall at Cottonwood Wash.

The Safford Landfill, operated by Graham County and primarily used by the cities of Safford, Thatcher, and Pima, is located near the confluence of Cottonwood and Peterson washes north of the Safford-Bryce Road and about five miles south of the project area. The landfill is not expected to be impacted by increased flows in Cottonwood Wash (Dames & Moore 1998c), as the estimated extent of increased scour is not expected to reach beyond approximately 1.7 miles below the diversion outfall (ibid.).

- **Partial Backfill Alternative.** As the Partial Backfill alternative proposes identical retention, detention, and diversion structures, this alternative would result in direct and indirect impacts to 100-year floodplains that are identical to those described for the Proposed Action alternative.

- **No Action Alternative.** This alternative would not affect 100-year floodplains within the project area as no activities would be permitted that impact drainages and their flows.

4.3.2.6.5 Waters of the U.S.

- **Proposed Action Alternative.** Within an approximately 16,625-acre study area that included the public and private lands proposed for mining use, 113.92 acres of waters of the U.S. and 0.03 acres of wetlands (at Cottonwood and Bryce Springs) have been delineated (SWCA 1997e) and approved by the COE as jurisdictional. Under this alternative, about 21.4 acres of jurisdictional waters within this study area would be directly impacted by mining and mining-related activities (Table 4-13). In addition, about 93.2 acres of jurisdictional waters, some within and some outside the study area, would be indirectly impacted. No impacts on the jurisdictional wetlands are expected. DP Seep, which lies within the project footprint and would be removed during mine elevation, does not meet the criteria to be considered a jurisdictional wetland.

Table 4-13. Impacts to Waters of the United States Resulting from the Proposed Action

Activity	Impacted Acreage
Direct Impacts	
Fill	16.5
Excavation	4.9
Indirect Impacts	
Scour	3.0
Upstream Diversions [1]	4.1
Downstream Diversions [2]	82.9
Other Impacts	3.2
TOTAL	**114.6**

[1] Upstream diversions refer to waters impacted by the upstream diversion ditch and occur between the mine facilities and upstream diversion ditches.
[2] Downstream diversions refer to jurisdictional arroyos on the downstream side of the mine that are dewatered at the downstream extent of direct impact acres.

Direct impacts to waters of the U.S. would result from excavation and fill activity in washes during construction of the stormwater diversion system and development of the mines. Functions of waters of the U.S., such as wildlife habitat and stormwater conveyance, are assumed to be completely lost in the 21.4 acres directly affected. Indirect impacts would result from downstream dewatering in washes losing diverted stormwater flow; from scour effects and some xeroriparian vegetation enhancement in washes receiving diverted flows; and from a reduction in overall watershed area due to mine development. Functions in these areas would not be reduced below values found in adjacent uplands (SWCA 1997g); therefore, maximum impact to the 93.2 acres indirectly affected is assumed to be 50 percent. Based on these assumptions, impacts to a total of 68 acres of jurisdictional water of the U.S. would have to be mitigated under Section 404 of the Clean Water Act (CWA). The proposed mitigation—creation of 30 acres of riparian habitat, enhancement of 18 acres of riparian and wetland habitat, and preservation of 160 acres of riparian habitats along the Gila River—is presented in Appendix F.

- **Partial Backfill Alternative.** The backfilling into the San Juan pit with nearly 27 percent of the development rock generated by the Project results in reduced height of the development rock stockpiles rather than reduced footprints. Therefore, this alternative is expected have direct and indirect impacts on waters of the U.S. to the same degree as the Proposed Action alternative.

- **No Action Alternative.** This alternative proposes no activities that would result in direct or indirect impacts to waters of the U.S.

4.3.3 Biological Resources

4.3.3.1 Vegetation

4.3.3.1.1 Proposed Action Alternative. The Proposed Action alternative is expected to result in direct impacts to three of the four upland vegetation communities on public lands in the project area: 1) Sonoran Desertscrub, 2) Sonoran Desertscrub/Semidesert Grassland ecotone, and 3) Disturbed Land. The fourth upland community, Semidesert Grassland, grows at elevations above the planned mining activities and would probably not be affected. Upland vegetation on the mining site would be cleared or grubbed to construct pits, stockpiles, leach pad, haul and access roads, shops, stormwater diversions, and other facilities. Some native cacti, primarily barrel cactus, may be salvaged for revegetation/reclamation purposes. Some (unquantified amount) Xeroriparian Mixed Scrub growing along washes would be disturbed by the stormwater diversions, both by construction activities and the dewatering of some drainages. Riparian vegetation associated with perennial springs is not expected to be directly or indirectly impacted by the Project.

Table 4-14 summarizes the direct impacts of the Proposed Action alternative on the six habitat types occurring in the project area. These values (in acres) are based on the impact calculations provided in Chapter 2 for the various mine facilities proposed under this alternative. Approximately 60 percent of the affected vegetation grows on BLM-administered public lands; 40 percent on PD property.

Table 4-14. Acres of Vegetation Communities Expected to Be Impacted by the Proposed Action Alternative

	Sonoran Desertscrub	Semidesert Grassland	Sonoran Desertscrub-Semidesert Grassland	Disturbed	Xeroriparian Mixed Scrub	Riparian at Springs	TOTAL
BLM Land	529	0	1,222	184	unquantified	0*	1,935
PD Land	274	0	1,000	113	unquantified	0*	1,387
State Land	0	0	10	0	unquantified	0*	10
TOTAL	**803**	**0**	**2,232**	**297**	**unquantified**	**0***	**3,332**

* No direct or indirect impacts are expected.

While loss of vegetation under the stockpiles and leach pad would be permanent, other areas, such as the side slopes and tops of the development rock stockpiles and the leach pad, would be reclaimed and revegetated to provide erosion control and slope stability (see Section 2.1.2.4 in Chapter 2). PDSI would evaluate, as part of project development activities, opportunities for salvaging native cacti to be used for on-site revegetation.

4.3.3.1.2 Partial Backfill Alternative. This alternative would result in direct and indirect impacts identical to those described under the Proposed Action alternative.

4.3.3.1.3 No Action Alternative. Under the No Action alternative, no mine-related impacts to vegetation resources on the project area would occur.

4.3.3.2 Wildlife Resources

4.3.3.2.1 Proposed Action Alternative. Due to the loss of habitats (i.e., vegetation communities) in the project area resulting from construction of mine facilities, the Proposed Action alternative is expected to affect some wildlife, including game species such as mule deer, collared peccary (javelina), mountain lion, doves, and quail. This alternative is also expected to affect nongame birds, smaller mammals, herptiles, and invertebrate wildlife. Table 4-15 gives the estimated number of mule deer and javelina that could be impacted under this alternative based on density estimates provided by the Arizona Game and Fish Department (AGFD) for the project area. Direct impact to big game species on public and state lands would primarily affect recreational hunting use of this portion of AGFD Hunt Unit 28.

Table 4-15. Estimated Number of Mule Deer and Javelina in the Project Area Impacted as a Result of the Proposed Action Alternative (based on AGFD density estimates)

	Mule Deer (4 to 7/sq mi)	Javelina (1.5 to 3/sq mi)
BLM Land	12 to 21	5 to 9
PD Land	8 to 14	3 to 6
State Land	< 1	< 1
TOTAL	**21 to 35**	**10 to 16**

Creation of pit lakes is not expected to significantly affect wildlife. Larger terrestrial species would be prevented from gaining access by proposed fencing for safety objectives and site security. Some birds could occasionally use the pit lakes for resting, and bats could forage for insects over them and drink from them; however, such activity is not expected to adversely impact these animals based on modeled pit lake water quality. "Long-term simulation of the pit water quality indicates that given the neutralizing capacity of the exposed rocks [in the Dos Pobres pit], and the slightly alkaline groundwater inflow, the pit lake water would most likely remain neutral. No adverse effect to...avian species is anticipated" (Water Management Consultants 1997). For the San Juan pit lake, "the predicted lake water is not considered a threat to wildlife or the environment in the long term" (ibid.).

The excess solution containment impoundment at the downgradient toe of the leach pad would also be located within the fenced active mine site. However, the surface of the impoundment would be exposed and accessible to birds and bats. PLS is acidic (generally with a pH below 2.0) and toxic, typically containing high concentrations of total dissolved solids, heavy metals, and sulfates (see Table 4-16 for chemical composition of PLS for the Project as compared to BLM benchmark standards for wildlife). Unlike cyanide ponds at gold mines which have been associated with adverse impacts on wildlife, PLS impoundments are brightly-colored and have an acidic/acrid odor. Anecdotal information from wildlife agency personnel and mine personnel suggest that there is little in or around PLS ponds to attract birds or bats to rest in, drink from, or forage over the ponds and indicate that wildlife impacts from exposure to PLS ponds at other copper mines in Arizona have not been documented (T. Hughes, BLM, pers. comm.; L. Thrasher, BLM, pers. comm.; R. Haughey, AGFD, pers. comm.; K. King, USFWS, pers. comm.; J. Korolsky, PDSI, pers. comm.). However, PDSI will monitor potential wildlife use of the excess process solution impoundment for one year. Should monitoring results indicate that significant adverse impacts are occurring to wildlife, appropriate mitigation measures would be implemented.

Table 4-16. Data on Chemical Composition of Pregnant Leach Solution (PLS) from Ongoing Column Leach Tests for Dos Pobres/San Juan Project Compared to BLM Benchmark Standards

	Units	PLS Characteristics	BLM Benchmark Standards for Wildlife
General Parameters			
pH	-	1.52-2.70	-
Total Dissolved Solids	mg/L	44000-57000	-
Fluoride	mg/L	<1.0	5.3
Sulfate	mg/L	34000-41000	-
Trace Metals, Total Dissolved			
Aluminum	mg/L	3400-4000	21
Antimony	mg/L	<1.0	0.17
Arsenic	mg/L	<1.0	0.94
Barium	mg/l	<0.1-0.55	-
Beryllium	mg/L	<0.50	-
Cadmium	mg/L	6.7-7.8	0.23
Chromium	mg/L	0.98-2.6	-
Copper	mg/L	1100-2800	1.1
Iron	mg/L	150-3100	-
Lead	mg/L	<1.0	-
Manganese	mg/L	240-300	0.78
Mercury	mg/L	<0.002	0.002
Nickel	mg/L	2.7-4.8	-
Selenium	mg/L	<1.0	0.57
Silver	mg/L	<0.50	14
Thallium	mg/L	<2.0	0.002
Zinc	mg/L	470	0.834

Source of PLS Data: J. Korolsky, PDSI, Pers. Comm.
< Number = Less than detection limit

After major storm events, the stormwater impoundment would likely contain diluted PLS and other runoff from the areas upgradient of it. As this is expected to rarely occur, the filled stormwater impoundment is not considered a facility that would be a regular or permanent attraction to wildlife.

4.3.3.2.2 Partial Backfill Alternative. This alternative would result in impacts to wildlife that are identical to those of the Proposed Action alternative.

4.3.3.2.3 No Action Alternative. This alternative would have no direct or indirect effects on wildlife or wildlife habitats.

4.3.3.3 Special Interest Species

4.3.3.3.1 Threatened and Endangered Plants.

- **Proposed Action Alternative.** No known listed, proposed, or candidate threatened or endangered plant species are likely to be directly or indirectly impacted under this alternative. Neither the undetermined hedgehog cactus *Echinocereus* sp. nor its habitat are likely to be impacted by the Project because all mine facilities are located below the elevations at which this cactus and its potentially suitable habitat have been observed (SWCA 1997a).

- **Partial Backfill Alternative.** The effects of this alternative on threatened and endangered plants would be identical to those described under the Proposed Action alternative.

- **No Action Alternative.** This alternative would not impact threatened or endangered plant species.

4.3.3.3.2 Threatened and Endangered Animals.

- **Proposed Action Alternative.** No threatened or endangered animal species are likely to be directly or indirectly impacted by the Proposed Action alternative. The project area does not provide suitable habitat for any listed, proposed, or candidate animal species, nor have any individuals of such species been recorded from the site (Table 4-17).

Table 4-17. Summary of Anticipated Impacts of the Proposed Action Alternative on Threatened or Endangered Animal Species Potentially Occurring Near the Project Area

Species	Status*	Direct and Indirect Impacts
Gila topminnow	E	No direct or indirect impacts expected
Razorback sucker	E	No direct or indirect impacts expected
Cactus ferruginous pygmy-owl	E	No direct or indirect impacts expected
Southwestern willow flycatcher	E	No direct or indirect impacts expected
Bald eagle	T	No direct or indirect impacts expected

* E = endangered; T = threatened

The only listed animal species known to occur near the project area that could possibly be indirectly affected by the proposed Project is Southwestern willow flycatcher and Gila topminnow. Southwestern willow flycatcher occurs along the Gila River south of the project area and Gila topminnow is present in a spring in Watson Wash southwest of the project area. Additionally, though it is unlikely that any razorback suckers remain in the Gila River, designated critical habitat for this species could be indirectly affected by the proposed Project. Cactus ferruginous pygmy-owl is unlikely to occur along the Gila River and bald eagle is expected to occur infrequently. The small maximum reduction in flow in the Gila River as a result of the Project is not expected to significantly affect any of these listed species.

Of the expected maximum 129.4 af/yr reduction in Gila River flows, 75.4 af/yr will be compensated for by the fallowing program described in the Habitat Mitigation and Monitoring Plan (Appendix F). The remaining 54 af/yr represents less than 0.02 percent of the average annual discharge of the Gila River at the Calva gaging station (283,600 af) and less than 0.26 percent of the lowest annual discharge recorded between 1930 and 1995 (approximately 20,800 af/yr; USGS 1996). This small maximum reduction in flow is not expected to significantly affect any of the listed species along the Gila River or the habitats on which they depend especially since the reduction in flow will be spread across an entire year and reductions during any season will constitute minuscule percentages of the river's flow. Furthermore, runoff from the project site into the Gila River occurs as unpredictable, short-duration events. Changes in the quantity and duration of flows from these tributaries into the Gila River are unlikely to significantly affect aquatic or riparian habitats. The proposed fallowing program described in the Habitat Mitigation and Monitoring Plan (Appendix F) will reduce any potential for indirect impacts to listed species.

Groundwater modeling has predicted that groundwater pumping at the Project could reduce wellhead pressure at the Watson Wash artesian well supporting Gila topminnows by 0.47 ft at 126 years after Project initiation. Mitigation plans consist of regularly monitoring wellhead pressure and, if a reduction in water flow is observed in "early warning" monitoring wells, reducing the height of the well's discharge pipe to maintain flow pressure.

- **Partial Backfill Alternative.** The effects of this alternative on threatened or endangered animals would be identical to those described under the Proposed Action alternative.

- **No Action Alternative.** This alternative would result in no direct or indirect impacts to threatened or endangered animal species.

4.3.3.3.3 Critical Habitat. No proposed or designated critical habitat for any listed or proposed threatened or endangered species occurs in the project area.

- **Proposed Action Alternative.** No designated critical habitat for listed species would be directly impacted by the Project. It is unlikely that critical habitat for the razorback sucker in the Gila River south of the project area would be indirectly impacted by expected reductions in river flows resulting from groundwater pumping and stormwater diversions at the Project. The potential for an indirect impact will be reduced by implementation of the fallowing program described in the Habitat Mitigation and Monitoring Plan (Appendix F).

- **Partial Backfill Alternative.** The effects of this alternative on critical habitat would be identical to those described under the Proposed Action alternative.

- **No Action Alternative.** No designated critical habitat would be affected by this alternative.

4.3.3.3.4 BLM Sensitive Species. One BLM sensitive plant species (Pima Indian-mallow) and four BLM sensitive animal species (California leaf-nosed bat, Townsend's big-eared bat, cave myotis, and Gila monster) are known or likely to occur regularly in the project area. Eleven additional BLM sensitive species (northern goshawk, ferruginous hawk, common black-hawk, yellow-billed cuckoo, burrowing owl, small-footed myotis, long-legged myotis, fringed myotis, Yuma myotis, Allen's big-eared bat, and greater western mastiff bat) may occasionally visit the project area. Two other BLM sensitive species, Chiricahua leopard frog and Gila chub, are known to occur nearby.

- **Proposed Action Alternative.** The known population of Pima Indian-mallow grows outside areas that would be impacted by the proposed Project. Most of these areas do not appear to contain suitable habitat for the plant, although a comprehensive survey for Pima Indian-mallow was not conducted (SWCA 1997a). No direct or indirect impacts to this species are anticipated; nor are impacts expected to California leaf-nosed bat, Townsend's big-eared bat, or cave myotis. All existing mine features known to be used by these bats (sites 3, 5, 6, 13, 20, and 21) or that appear to be potential roosting habitat for them (sites 1, 9, 10, 11, and 19) lie outside areas of potential disturbance (Figure 3-13) and bats are unlikely to be attracted to or use solution ponds for drinking or foraging. Suitable habitat for the Gila monster is present on both BLM and PD lands in areas that would be affected by mining-related activities. It is likely that an undetermined number of individuals of this species would be lost under this alternative; however, the impact is not likely to lead to loss of population viability or extirpation of the Gila monster from the general area. The 11 species that occasionally may visit the project area are likely to appear irregularly, if at all; therefore impacts to these species are not expected. Chiricahua leopard frog is known to occur along the Gila River but is not expected to be impacted for the reasons given in Section 4.3.3.3.2. Gila chub is known to occur in Bonita Creek, where no significant impacts to surface water flows are expected.

- **Partial Backfill Alternative.** The effects of this alternative on BLM sensitive species would be identical to those described under the Proposed Action alternative.

- **No Action Alternative.** This alternative would result in no direct or indirect impacts to BLM sensitive species.

4.3.3.4 Biodiversity

4.3.3.4.1 Proposed Action Alternative. As measurements of biodiversity are scale-dependent, so too would be the Project's impacts on biodiversity. Although there is no question that biodiversity of land directly impacted by the Project, such as mining pit sites, would be significantly reduced, the overall biodiversity of the region, even of public lands in the project area, would not be affected. The population viability of species of plants and animals in the area would not likely be affected in either the short or long term by the Project; therefore, this alternative is not expected to adversely affect biodiversity.

4.3.3.4.2 Partial Backfill Alternative. Impacts to biodiversity of the region from this alternative would be identical to those described under the Proposed Action alternative.

4.3.3.4.3 No Action Alternative. This alternative would maintain the *status quo* of the subject lands and would have no direct or indirect impacts on the biodiversity of the project area or of the surrounding region.

4.3.4 Cultural Resources

4.3.4.1 Historic and Prehistoric Archaeological Resources

4.3.4.1.1 Proposed Action Alternative. The Proposed Action would destroy or damage 34 of the 117 archaeological sites located in the project area (see mitigation described in Table 4-41 at the end of the chapter). Of the affected sites, 12 are located on BLM-administered federal lands, 21 are on PD lands, and 1 is on state land. Thirty-two of these sites are considered to be potentially eligible for nomination to the National Register of Historic Places (National Register) for their scientific values. Of these 32 sites, 14 are prehistoric, 9 are historic, 5 are multicomponent, and 4 are sites of unknown temporal association. Table 4-18 lists the site numbers of both the potentially eligible and ineligible sites.

Table 4-18. Archaeological Sites that Would be Directly Impacted by the Proposed Action Alternative

Federal Lands		PD Lands		State Lands
Sites Considered Potentially Eligible for the National Register for Their Scientific Values				
AZ CC:2:148	AZ CC:2:193	AZ CC:2:150	AZ CC:2:163	AZ CC:2:252
AZ CC:2:149	AZ CC:2:197	AZ CC:2:155	AZ CC:2:164	AZ CC:2:257
AZ CC:2:151	AZ CC:2:204	AZ CC:2:156	AZ CC:2:165	AZ CC:2:258
AZ CC:2:152	AZ CC:2:213	AZ CC:2:157	AZ CC:2:169	AZ CC:2:259
AZ CC:2:191	AZ CC:2:215	AZ CC:2:158	AZ CC:2:241	AZ CC:2:269
AZ CC:2:192		AZ CC:2:159	AZ CC:2:242	AZ CC:2:274
		AZ CC:2:160	AZ CC:2:245	AZ CC:2:277
Sites Considered Ineligible for the National Register for Their Scientific Values				
AZ CC:2:206				AZ CC:2:176

Project components that would damage or destroy archaeological sites include the Dos Pobres and San Juan pits, West and East development rock stockpiles, leach pad, primary crusher facility, aggregate source pit, San Juan soil stockpile, West Diversion Channel, Peterson Wash Diversion, four transmission lines, two roads, and activity in the Site #1 area. Sixteen of the 34 sites could be avoided by judiciously positioning transmission line components, realigning roads, and repositioning the soil stockpile.

4.3.4.1.2 Partial Backfill Alternative. This alternative would result in impacts to archaeological sites that are identical to those described under the Proposed Action.

4.3.4.1.3 No Action Alternative. The No Action alternative would not affect historic and prehistoric archaeological resources in the project area. No mining would be authorized; therefore, none of the 117 sites in the project area would be physically impacted by mining. Other federal management actions may apply.

4.3.4.2 Traditional Cultural Properties Identified by Indian Tribes

4.3.4.2.1 Proposed Action Alternative. Indian tribes consulted for this project consider 74 of the 117 archaeological sites in the project area to be traditional cultural properties (see Table 3-20). The Proposed Action would damage or destroy 23 of the properties: 9 on federal lands and 14 on PD lands (Table 4-19). All 23 are considered by some consulting tribes to be eligible to the National Register as Traditional Cultural Properties (SWCA 1997k); however, the official eligibility determinations, which in this case are the responsibility of the BLM and the Arizona State Historic Preservation Office, have yet to be made.

In addition, archaeological sites AZ CC:2:200 and 211, which lie very near a planned project feature and are therefore potentially vulnerable to disturbance, were identified by the Four Southern Tribes as "sacred sites" as well as traditional cultural properties. The White Mountain Apache Tribe identified one of the two sites, AZ CC:2:211, as being sacred to them as well. Both sites are located on federal land, and, as such, are subject to Executive Order 13007 "Indian Sacred Sites," May 24, 1996. This order requires federal agencies to "to the extent practicable and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid

Table 4-19. Sites Identified by Indian Tribes as Being Traditional Cultural Properties that Would be Directly Impacted by the Proposed Action Alternative

Federal Lands		PD Lands		
AZ CC:2:148	AZ CC:2:192	AZ CC:2:150	AZ CC:2:159	AZ CC:2:245
AZ CC:2:149	AZ CC:2:193	AZ CC:2:155	AZ CC:2:160	AZ CC:2:257
AZ CC:2:151	AZ CC:2:213	AZ CC:2:156	AZ CC:2:164	AZ CC:2:269
AZ CC:2:152	AZ CC:2:215	AZ CC:2:157	AZ CC:2:169	AZ CC:2:274
AZ CC:2:191		AZ CC:2:158	AZ CC:2:241	

adversely affecting the physical integrity of such sacred sites." Accordingly, the BLM recommended that PDSI avoid sites AZ CC:2:200 and 211 and protect them from mining activities by creating buffer zones around them and by fencing AZ CC:2:211. The recommended width of the buffer zones is 100 meters, except on the eastern side of AZ CC:2:211, where it is 30 meters. The BLM also recommended that PDSI allow representatives from appropriate Indian tribes access to the sites for ceremonial purposes. PDSI has agreed to these recommendations, including the right of access to the sacred sites with reasonable notice; therefore, sites AZ CC:2:200 and 211 are not likely to be adversely affected by the Proposed Action.

4.3.4.2.2 Partial Backfill Alternative. Impacts to traditional cultural properties under this alternative would be identical to those described under the Proposed Action.

4.3.4.2.3 No Action Alternative. Under this alternative, mining would not be authorized; therefore, none of the sites in the project area identified as being traditional cultural properties and/or sacred sites by Indian tribes would be physically affected by mining.

4.3.5 Socioeconomic Resources

Impacts of the mine plan alternatives set on the socioeconomic resources of the region are expected to be concentrated in the Safford/Thatcher/Pima corridor (referred to here as the Safford area) of Graham County, primarily in the City of Safford itself. The nature, timing, and magnitude of these impacts would reflect the Dos Pobres/San Juan Project's two major phases: the initial 15-month construction phase and the long-term, 16-year production phase (ESI 1997).

4.3.5.1 Population and Demographics

4.3.5.1.1 Proposed Action Alternative. The Proposed Action is expected to result in 145 new households, or 448 additional people, in Graham County. Of these new households, an estimated 108 would be associated with direct employment at the Project during its operational phase. The remaining 37 would result from indirect employment opportunities generated by the Project (see Section 4.3.5.2.1, Employment) (ESI 1997). Table 4-20 gives the percent growth represented by these figures for three areas: Graham County; the Safford area (Incorporated Safford, Thatcher, and Pima combined); and the City of Safford alone. An estimated 67 percent of all growth is expected to occur within the Safford city limits,(see Section 4.6.1.3.1 Housing). Growth information is provided for both households and population. The year 1995 was chosen as the base year for this analysis because the most recent official census (a special census) was conducted in that year.

Table 4-20. Estimated Percent Increase in the Number of Households and Population of Graham County, the Safford Area, and the City of Safford Attributable to the Proposed Action

Area	No. Of Households (1995)	Percent Growth in No. of Households	Population (1995)	Percent Growth in population
Graham County	9,937	1.5%	29,772	1.5%
Safford Area	5,455	2.7%	14,580	3.1%
City of Safford	3,468	4.2%	8,773	5.1%

This table shows that the Proposed Action alternative would result in an estimated growth in the population of the Safford area of about 3.1 percent. Safford itself is likely to see an increase closer to 5.1 percent (assuming that Safford sees two-thirds of the growth). Graham County, having the largest base population, would be impacted the least, with an estimated increase of only 1.5 percent.

The State of Arizona Department of Economic Security has projected the overall population growth in Graham County for the years 1995-2005. They expect the county to grow by 2,466 households, or 8,553 individuals, a robust increase of 24.8 percent and 28.7 percent, respectively. The Dos Pobres/San Juan Project's estimated contribution of 145 new households and 448 individuals (ESI 1997) represents only about 5.9 percent and 5.2 percent, respectively, of this projected growth.

Minority Groups and Low-Income Populations. Like the general population, minority groups in the Safford area are expected to benefit from the Proposed Action, which would provide additional opportunities for short-term jobs during the project construction phase and long-term jobs during the production phase. The Project would generate, either directly or indirectly, an estimated total of 644 new jobs in the Safford area by the year 2014 (see Section 4.3.5.2.1, Employment). It is expected that this employment would reflect the demographic profile of the Safford area, including representative numbers from minority and low-income populations (ESI 1997). PDSI itself is expected to hire approximately 80 percent of its projected 250-person labor force locally, paying an average salary of approximately $36,000 (1997 dollars). Approximately 80 percent of these relatively high-paying jobs are classified as "laborer," a category that does not necessarily require specialized skills or extensive formal education—prerequisites that often function as barriers to employment for members of disadvantaged groups. Indirect employment from the Project is expected to be concentrated in the retail and service sectors, where jobs tend to be low-paying but require relatively low levels of formal education. These jobs may be filled disproportionately by individuals from minority or low-income populations.

Most of the increased employment opportunities under the Proposed Action would be located in the Safford area, which includes relatively high proportions of Hispanic and low-income households (see Section 3.2.5.1.1 Minority Groups and Low-Income Populations). Safford is close (within 10 mi) to the communities of Solomon, San Jose, and Sanchez, which are heavily Hispanic. However, Safford is relatively far (about 30 and 50 mi, respectively) from Bylas and Periodot, the major Native American population centers in the county.

4.3.5.1.2 Partial Backfill Alternative. Impacts of this alternative would be identical to those of the Proposed Action.

4.3.5.1.3 No Action Alternative. The No Action alternative would not cause any change in the population size and demographics of Graham County. Population would continue to grow in the Safford area as a result of factors other than mining (e.g., increased tourist-based business, influx of retirees, etc.).

4.3.5.2 Local and Regional Economy

4.3.5.2.1 Employment.

- **Proposed Action Alternative.** The Proposed Action is expected to result in a more diversified local economy by adding mining-related jobs to the mix, increasing non-agricultural wage and salary employment by an estimated 9.0 percent over 1996 levels.

  - **Direct Employment.** Under the Proposed Action alternative, employment during the construction phase of the Project is expected to range from 150 full-time jobs in the first month to a peak of 980 full-time jobs in the eighth month, declining to 50 jobs in the last (fifteenth) month. The average construction employment for the Project would be approximately 470 workers (PDSI 1996). Potential construction firms have indicated that the Safford/Thatcher and Clifton/Morenci areas could possibly supply up to 40 percent of the needed construction workers (ESI 1997). Given these estimates, an estimated 390 temporary jobs could be filled by the local labor force. The availability of construction jobs would likely reduce the unemployment figure in the Safford area, which currently stands at 7.1 percent (about 240 individuals), but by an undeterminable number that depends in part on the suitability of unemployed individuals at the time of recruitment.

    The operational phase of the Project is anticipated to begin in the twelfth month of the 15-month construction schedule (ESI 1997). Once fully operational, the Project as described in the Proposed Action alternative is expected to provide approximately 250 direct, full-time, salaried jobs. This figure may be higher at periods of maximum production. Three general categories of jobs that would be filled and the number of jobs they comprise are shown in Table 4-21.

Table 4-21. Breakout of Types of Employee Positions under the Proposed Action Alternative

Employee Category	Number of Positions	Percent of Total
Administrative (supervisory, clerical, and support staff)	29	12%
Technical (engineering)	20	8%
Labor (craftsmen, operators, skilled and general laborers)	201	80%

Source: ESI 1997, Table II-13

PDSI expects about 80 percent of the workforce to be local hires from Graham and Greenlee counties, including the communities of Bylas, Fort Thomas, Pima, Central, Thatcher, Safford, Solomon, San Jose, York, Clifton, Morenci, and Duncan. The other 20 percent are expected to come from outside the region. Workers drawn from the outside would most likely bring needed technical, journeyman-level skills in specific mining-related trades (ESI 1997).

The majority of new local employment would likely come from the Safford area, the region's largest population center. These employees would include entry-level workers; individuals currently numbered among the County's unemployed; and individuals currently holding other jobs who would prefer higher-paying mining jobs (ESI 1997). It is unknown what proportion

of new local hires would come from each of these sources; therefore, the magnitude of the Proposed Action's impact on the area's unemployment figure or on the distribution of labor among economic sectors is also unknown. Most new local hires would fall into the PDSI "labor" category, many requiring little if any mining experience. All hires, however, must have completed a PDSI-sponsored, locally available, eight-week training program in interactive communications. This program is designed to prepare PDSI employees for the self-directed teams that would characterize the Project's work environment (ESI 1997).

It is expected that an undetermined number of experienced mine workers would transfer to the Project from PD's Morenci (PDMI) operation. A portion of such workers currently living in the Clifton/Morenci area may elect to stay there and commute to their new jobs, thus lessening the impact of their employment on the Safford area's economy. It is likely, however, that some transfers from PDMI to PDSI would come from the approximately 32 percent of PDMI workers who already live in the Safford area and now commute to Morenci. Vacancies in the Morenci operation would likely be filled from the approximately 3,000 active applications normally on file with PDMI. Other than this shift in personnel, the socioeconomic conditions in Greenlee County should remain unaffected by the Proposed Action (ESI 1997).

In addition to the salaried workforce, PDSI estimates that local contractors would employ 100 workers to provide certain maintenance and fabrication services over the life of the Project. The four types of jobs that would be filled by contracted labor is shown in Table 4-22. PDSI also plans to hire an average of 15 college students for 10-12 weeks each year in a 40-hour-per-week summer internship program (ESI 1997).

Table 4-22. Break-out and Estimated Hourly Wages of Anticipated Contract Workers for the Project under the Proposed Action Alternative

Worker Category	Estimated Percentage of Total	Estimated Hourly Wage
Supervisor	10%	$20-22
Craftsman	25%	$12-13
Helper	25%	$8-9
Laborer	40%	$6-7

Source: ESI 1997

- **Indirect employment.** Direct employees, both salaried PDSI employees and contract workers, would generate a demand for goods and services that would lead to additional, or indirect, employment across all sectors of the region's economy. Local expenditures by PDSI for goods and services to support project operations would also result in a certain amount of indirect employment. PDSI is expected to spend approximately $103,000,000 in local expenditures over the life of the project (ESI 1997, Table II-18a).

  Because Safford is already the region's service center, and because most of the new PDSI employees would probably live in the Safford area, that community is expected to be the locus for the increased demand. The multiplier effect of the direct employment in this case is expected to be fairly high, from 1.74 to 1.84 (ESI 1997). Consequently, the direct

employment of 350 workers (250 salaried PDSI employees plus 100 contract workers) is expected to generate a total employment of 623 by the year 2005; 634 by the year 2010; and 644 by the year 2014. Currently, wage and salary employment in Graham County as a whole totals 7,100. The largest share of the new indirect employment (294 by 2014) would likely occur in Safford's retail and service sectors. The most pronounced consequences of the overall increased employment would be a proportional increase in demands on housing, schools, and utilities in the Safford area (ESI 1997).

- **Partial Backfill Alternative.** Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** The No Action alternative would not cause any change in employment figures in the Safford area or in Graham County as a whole.

4.3.5.2.2 Income.

- **Proposed Action Alternative.** This alternative would result in increased income for the workers who shift from low-paying jobs (which are typical in the Safford area) to higher-paying construction- and mine-related work. The overall income from the increased direct and indirect employment generated by the Dos Pobres/San Juan Project would inject relatively large amounts of money into the local economy.

  The construction payroll over the 15 months needed to reach full project build-out is estimated to total $25,285,000 (1997 dollars). Once the mines are operational, the PDSI payroll for salaried workers is estimated to average $9.0 million per year, totaling $144 million over the 16-year production life of the Project. The payroll for contract workers is estimated at $2.5 to $3.0 million per year, for a total of $44 million over the life of the Project. The internship payroll would range from $60,000 to $72,000 each year, for a total of $0.96 million to $1.15 million. Consequently, from the beginning of the construction phase to the end of the projected life of mining operations, PDSI would pay its direct and contracted employees well over $214 million in wages (ESI 1997).

  The average annual direct (unfringed) income of a PDSI salaried worker is expected to be $36,000 (1997 dollars) (ESI 1997). This would be a high-paying job for a member of the Graham County labor force. Assuming one PDSI employee per household, and no other source of income in the household (a conservative assumption), an annual income of $36,000 compares very favorably to the current median household income in Graham County of $18,455.

  The hourly wages for the estimated 100 contract workers are reported in Table 4-22. According to this estimate, 65 percent of these workers would be paid between $6 and $9 per hour, which, if annualized based on a full-time, 40-hour-week, would come to between $12,480 and $18,720 per year. The highest-paid 10 percent of the workers would earn between $41,600 and $45,760 per year (ESI 1997).

  Indirect employment resulting from the Proposed Action most likely would be concentrated in the lower-end retail and services sector of the local economy, which already accounts for a large percentage of jobs in the Safford area and which often pays too little to support a family. Higher-paid jobs—for example in construction, teaching, or the medical field—would also be generated but would be in the minority (ESI 1997).

- **Partial Backfill Alternative.** Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** The No Action alternative would not change income characteristics in the Safford area or in Graham County as a whole.

4.3.5.2.3 Taxes.

- **Proposed Action Alternative**. The estimated total Arizona state and local taxes that would be generated by the Proposed Action over the life of the Project is estimated at $150,875,700. This revenue would come from two sources: taxes paid by PDSI and taxes paid by workers as a result of direct and indirect employment (Table 4-23). State and local taxes paid by PDSI are estimated to total about $137.7 million. In addition, PDSI would pay an estimated $282.54 million in federal income and payroll taxes over the life of the Project, bringing their total estimated tax contribution to over $420 million (ESI 1997). Direct and indirect employment resulting from the Proposed Action would contribute an estimated $13,175,700 in the state and local tax revenue. A breakdown of these tax payments is presented in Table 4-24.

Table 4-23. Estimated Total (16-year Life of Project) State and Local Tax Revenue That Would Be Generated by the Proposed Action

Tax Payer	Property (local)	Sales (state & local)	Income (state)	Severance (state)	Construction (state & local)	TOTAL
PDSI	$52,000,000	$5,400,000*	$43,000,000	$31,000,000	$6,300,000	**$137,700,000**
Employees (Direct & Indirect)	$2,229,000	$562,700	$10,384,000	-	-	**$13,175,700**
TOTAL	**$54,229,000**	**$5,962,700**	**$53,384,000**	**$31,000,000**	**$6,300,000**	**$150,875,700**
Average Annual	**$3,389,313**	**$372,669**	**$3,336,500**	**$1,937,500**	**$393,750**	**$9,429,732**

Sources: ESI 1997, Tables II-17 & II-18; J. Korolsky, PDSI, pers. comm.

* Includes state sales taxes paid for purchases made outside the local area. An estimated $654,284 would be paid in Graham County (Based on ESI 1997, Table II-18b).

The impact of the Proposed Action on tax revenues available to Graham County and the communities of Safford, Thatcher, and Pima would be major. Graham County collects the property tax, which represents the bulk of increased local tax revenues, and a 0.05 percent sales taxes. The communities of Safford, Thatcher, and Pima each collect a 1.0 percent sales tax. The county and each of these communities also receive a percentage of the sales, severance, and income taxes collected by the state through Arizona's revenue-sharing program. Distributions of state sales and severance taxes to each county in the state are based on both the total amount of collections in a given county and the proportion of the state population represented by that county. Disbursements sales and severance tax revenue to municipalities are based solely on population. Distribution of state income tax to counties and municipalities is based on population.

Table 4-25 provides the percentages of total state sales, severance, and income tax collections that were returned to Graham County and the communities of Safford, Thatcher, and Pima in 1994 (ESI 1997). Based on these percentages and the estimated revenue totals shown in Table 4-23, the Proposed Action could contribute an estimated total of $57.6 million, or an estimated annual average of $3.6 million, to local coffers over the life of the Project.

Table 4-24. Estimated State and Local Taxes That Would Be Paid by Workers under the Proposed Action

Property taxes generated from new home sales	$139,306 annually for a rounded total of $2,229,000
Sales tax generated as a result of consumption by construction workers	$24,700 over the 15-mo build-out
Sales tax generated as a result of consumption by new households	$33,612 annually for a rounded total of $538,000
State income taxes construction workers would pay	$575,750 over the 15-mo build-out*
State income taxes direct employees would pay	$343,000 annually for a total of $5,488,000**
State income taxes indirect employees would pay	Between $252,000 in 1999 and $288,000 in 2014*** for a total approximating $4,320,000

Source: ESI 1997

* Assuming each of the 470 construction workers(the average employment) would pay the Arizona 1995 statewide average of $980 per filer, averaged over 15 months.

** Assuming each of the 350 direct employees would pay the Arizona 1995 statewide average of $980 per filer.

*** Depending on the production scenario and ignoring inflationary effects.

Table 4-25. Distribution of State Revenue-Sharing Funds in Graham County (1994 Figures)

Recipient	Percent of Total State Sales and Severance Tax Collections	Percent of Total State Income Tax Collections
Graham County	0.52%	0.45%
Safford	0.26%	0.26%
Thatcher	0.13%	0.13%
Pima	0.06%	0.06%
TOTAL	**0.97%**	**0.90%**

Source: ESI 1997

- **Partial Backfill Alternative**. Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** The No Action alternative would not cause any change in tax revenues in the Safford area or in Graham County as a whole.

4.3.5.3 Infrastructure

4.3.5.3.1 Housing.

- **Proposed Action Alternative.** The impacts of the construction phase of the Proposed Action on housing would focus on short-term rental accommodations and motels. Currently, few rental opportunities are available in the Safford area to meet this demand (ESI 1997). The production phase of the Proposed Action is expected to affect long-term housing, generating 108 new housing units over the life of the Project (Table 4-26).

Table 4-26. New Households as a Result of Direct Employment Housing

Employment Housing Demand	Estimated Employees (Total)	Percent needing new housing	New Households
Newcomers/PDSI	250	20 %	50
Newcomers/Contract	100	15 %	15
Local/PDSI	200	15 %	30
Local/Contract	85	15 %	13
TOTAL	**635**	**17%**	**108**

Source: ESI 1997

The demand for new housing would likely be concentrated in the Safford area due to that community's proximity to 1) the project site, 2) employment opportunities for other household members, 3) available housing, and 4) goods and services. An estimated 67 percent of the new households generated by the Project would be located in the City of Safford, while the remaining 33 percent would be distributed throughout nearby Thatcher and Pima, and in the more rural areas (ESI 1997). The following assumptions were adopted to determine local housing demand related to employment at the Dos Pobres/San Juan Project:

- 80 percent of direct PDSI jobs would be filled within the local Graham/Greenlee area, 15 percent of which would require new housing;
- 20 percent of direct Dos Pobres/San Juan Project jobs would be filled by newcomers, 100 percent of which would require new housing;
- Of the 85 percent contract jobs filled by locals, 15 percent would demand new housing; and
- 15 percent of new contract jobs would be filled by newcomers demanding new housing.

- **Partial Backfill Alternative.** Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** The No Action alternative would not cause any change in the housing situation in the Safford area or in Graham County as a whole.

4.3.5.3.2 Utilities. (Water, Electric/Gas, Sewer, Telephone, Garbage)

- **Proposed Action Alternative.** Under this alternative, the estimated additional 145 households expected to result from the Dos Pobres/San Juan Project could burden the existing water system for the City of Safford and the communities Safford supplies (the Town of Thatcher and smaller, unincorporated areas in the immediate vicinity). Even though the estimated percent of growth in households in the area is small (less than 4.0 percent), Safford's water system has water rights to only 2,250 gallons per minute (gpm) (3,632 af/yr) from Bonita Creek, and they are currently pumping an average of 2,140 gpm (,3,454 af/yr) with a peak demand of about 4,000 gpm (6,456 af/yr). While the City is pursuing additional sources of water, their supply has yet to be augmented (H. West, BLM, pers. comm.)

  The estimated increase in households resulting from the Project is not expected to place an appreciable increased demand on sewer facilities, sources of electrical power, solid waste collection and disposal systems, or on public utility personnel and equipment in the Safford area. The city is building a new wastewater treatment plant with a maximum capacity of three million gallons/day that

could be operational by late 1998 or early 1999. The Town of Thatcher is presently upgrading its sewer system and expanding the system's capacity from 350,000 gallons per day (gpd) to 1 million gpd (ESI 1997).

The Proposed Action is expected to impact utilities and public services in a positive way by generating substantially increased tax revenues (approximately $66,500,000 over the life of the Project) for the City of Safford by which to pay for infrastructure needs that are expected as a result of the Project (see Section 4.3.5.2.3 and Table 4-23).

- **Partial Backfill Alternative.** Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** This alternative would result in no changes to utilities serving the Safford area.

4.3.5.3.3 Schools.

- **Proposed Action Alternative.** Safford area schools can expect increased enrollment as new families move into the Safford area to work at the Dos Pobres/San Juan Project or local businesses related to the Project and its employees. In the first year of production, an estimated 91 new school-age children are expected as a result of the Proposed Action. Over the life of the mine, an annual average of 95 new school-age children is expected (ESI 1997). Of these students, the Safford School District would receive 64; the Thatcher School District would receive 30. Both districts could anticipate an enrollment increase of 2.0 percent in the first one or two years of the Project. Safford schools are near capacity, and all Thatcher schools are at capacity or in need of replacement. The estimated 2.0 percent increase in students attributable to the Proposed Action would not contribute appreciably to an existing and growing need for additional school facilities and staff in the Safford School District, but even this small increase spread over 12 grades might be noticeable in Thatcher.

  The Proposed Action would also benefit local schools by generating increased property tax revenues. The Safford schools would be the primary beneficiary of this increase because the PD-owned property in the county is located in the Safford School District, and PDSI would pay approximately 95 percent of the expected $54 million increase in total property taxes resulting from the Proposed Action.

- **Partial Backfill Alternative.** Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** This alternative would result in no changes to schools in the Safford area.

4.3.5.3.4 Emergency Response.

- **Proposed Action Alternative.** This alternative would not result in appreciable increased demands on the law enforcement and fire-fighting organizations in the Safford area. Nor would it seriously exacerbate the current shortage of physicians and nurses. The Proposed Action would result in additional local tax revenues to help support law enforcement departments and purchase fire-fighting equipment. PDSI has already contributed to the local hospital in anticipation of any increased demands made by the Project on that facility.

- **Partial Backfill Alternative.** Impacts of this alternative would be identical to those of the Proposed Action.

- **No Action Alternative.** This alternative would result in no changes to emergency response capabilities in the Safford area.

4.3.5.4 Transportation

4.3.5.4.1 Proposed Action Alternative.

- **Roads.** Under the Proposed Action alternative, traffic in the Safford area is expected to increase as a result of employees and commercial trucks traveling to and from the mine site, although the anticipated increase would not exceed the capacity of any road in the study area. The roads and intersections would continue to operate at an acceptable level of performance (LOS "C" or better), even with the mine in full operation. The increase in traffic would be noticeable on the lowest-volume roads (i.e., the Safford-Bryce and Airport Roads) (Curtis Lueck 1997)

  During the construction phase of the Project, the expected distribution of daily traffic at major intersections in the Safford area is based on a peak of 980 employees with an average vehicle occupancy rate of 1.3 (or 754 employee round trips). An additional 100 round trips per day would be added for construction materials and miscellaneous travel, resulting in a maximum total of 854 vehicle round trips per day (Curtis Lueck 1997). Travel by employees is not expected to restrict any of the bridges. Trucks transporting materials from the east and south to the mine would use the Solomon Bridge to Airport Road, and trucks arriving from the west would use the Thatcher Bridge to Safford-Bryce Road, thus avoiding the narrow Safford Bridge (Eighth Avenue Bridge) and the more heavily traveled areas of Safford.

  During the operational phase, average daily traffic is forecasted at 325 employee round trips and 104 truck round trips (Figure 2-7). Employee trips, which are likely to use any of the four bridges crossing the Gila River, are not expected to cause travel to be restricted at any of these bridges. Additional traffic from material transport is expected to average 100 commercial trucks per day, which includes sulfuric acid tank trucks and other trucks carrying processing materials. Tanker trucks would avoid using the Safford Bridge so as not to impede traffic at that point (Curtis Lueck 1997).

  It is not expected that any roads in the study area would need to be widened as a result of the Proposed Action. The increase in heavy truck traffic on the Safford-Bryce Road could degrade the pavement of that road in places where the structural integrity is questionable. The safety of increased truck traffic on Safford-Bryce and Airport Roads could be compromised by the existence of at least five curves with advisory speeds of 25 miles per hour (mph) or less on roads posted for 55 mph. The Proposed Project would result in substantial payments by PDSI in state and local taxes that fund road repair.

- **Air Traffic.** The Proposed Action alternative would not impact air traffic around the Safford Municipal Airport. The proposed 230 kV powerline that would transmit power to the Project from the existing Hackberry 230 kV powerline southeast of the project site does cross through the protected area around the airport (see Section 3.2.5.4.4, Air Traffic, and Figure 3-16). However, the pole structures supporting the line would not rise above the constraining Horizontal or Conical Surfaces. Figures 4-18 and 4-19 depict the pole structures in relation to the imaginary surfaces at three points located along Cross Sections AA', BB', and CC', respectively (see Figure 3-16 for the positions of these cross sections). According to an initial transmission line design, the pole shown on Cross Section BB' would exceed the height limit by five feet; however, the design has been modified so that no poles along the line would pierce the Conical Surface (SWCA 1997h).

4.3.5.4.2 Partial Backfill Alternative. Impacts of this alternative would be identical to those of the Proposed Action.

4.3.5.4.3 No Action Alternative. This alternative would cause no change in transportation in the Safford area.

4.3.6 Indian Trust Resources

4.3.6.1 Proposed Action Alternative

Water rights to the Gila River owned by the San Carlos Apache Tribe and the Gila River Indian Community have been identified as Indian trust assets. This alternative would have no unmitigated impacts on water rights to the Gila River; therefore, no impacts to Indian trust assets. The expected impacts on surface flows in the Gila River as described in Sections 4.3.2.5.1 and 4.3.2.6.1 would be mitigated by implementing an alternate year fallowing program that leaves water in the Gila River that would otherwise be used by crops (see Appendix F for details of this mitigation). This unused water would then become available to downstream users holding priority rights, including the San Carlos Apache Tribe and the Gila River Indian Community.

4.3.6.2 Partial Backfill of San Juan Alternative

Like the Proposed Action alternative, the Partial Backfill alternative would not impact Indian trust resources.

4.3.6.3 No Action Alternative

The No Action alternative would not impact Indian trust resources.

4.4 LAND EXCHANGE ALTERNATIVES IMPACT ANALYSIS

4.4.1 Land Use

4.4.1.1 Public Lands Management

4.4.1.1.1 Land Exchange Alternative.

- **Selected Lands.** The direct impacts of the exchange on the selected lands include transfer of ownership of about 17,000 acres of public land administered by the BLM to Phelps Dodge. With the exchange of ownership of the land go all the rights, privileges, and obligations appurtenant to those lands. BLM's Safford Field Office would relinquish federal jurisdiction and management responsibilities for these lands, including oversight of the mining operations and reclamation activities proposed as the Dos Pobres/San Juan Project. Exchange of the selected lands would not affect any special management areas administered by the BLM such as ACECs, wildernesses, wild and scenic rivers, or National Conservation Areas (NCA), including Riparian NCAs.

  Other direct impacts of the exchange alternatives on the selected lands include consolidation of federal land and PD's private land holdings in the Safford Mining District, disposal of the Sanchez building, and reduction in the number of corners of land parcels shared by BLM with PD from 116 to 27 (Figure 4-5). This nearly 77 percent reduction in shared boundary corners represents a

mutually-improved ability of both BLM and PD to manage their respective lands surrounding and within the project area.

The foreseeable mining uses of the selected lands, including long-range potential uses of the Dos Pobres sulfide orebody and the Lone Star area, would occur without management and oversight by BLM, although federal oversight would still be provided by the COE and the EPA through their Section 404 and NPDES permits, respectively. Based on the conceptual foreseeable uses for these areas as described in Section 2.2.2.1.2, the potential mine development activities that would be involved in developing the Dos Pobres sulfide orebody and the Lone Star deposit would be subject to the requirements of the Clean Air Act, and the Clean Water Act as administered by the COE and the EPA, thereby providing the federal "triggers" for compliance with other federal environmental laws such as the Endangered Species Act, National Historic Preservation Act, and the National Environmental Policy Act. Therefore, the net effect of the exchange on public lands management is the loss of BLM jurisdiction in particular, and not federal oversight in general, for mining and mining-related support activities on private lands.

Under this alternative, the State Mine Inspector's Office would have jurisdiction over mining reclamation on private lands. State reclamation requirements are similar to federal requirements; Table 4-27 provides a comparative summary of the federal versus State of Arizona reclamation requirements.

Offered Lands. The exchange alternative would result in BLM acquisition of about 3,858 acres of offered lands consisting of eleven properties in five Arizona counties in exchange for about 17,000 acres of public lands in the BLM's Safford Field Office acquired by PD. Net change is a loss of 13,142 acres of public lands in Arizona. The Safford Field Office would have a net loss of 14,580 acres; the BLM's Tucson Field Office would enjoy a net gain of 1,120 acres; and the National Park Service would enjoy a net gain of 324 acres. Acquisition of the offered lands would result in the following effects to public lands management:

- Increase the BLM-administered lands within the Gila Box RNCA by 855 acres. This would reduce the acreage of private inholdings in the Gila Box RNCA nearly 50 percent, from 1,720 to 865 acres and from 15 to 13 private inholdings. This alternative also would put under BLM management an approximately two-mile portion of an 8.1 mile segment of Bonita Creek that has been recommended for Wild and Scenic River designation.

- Increase BLM-administered lands in the Empire-Cienega Resource Conservation Area (RCA) south of Tucson by 1,120 acres and remove four private inholdings.

- Increase BLM-administered lands in the Dos Cabezas Long-Term Management Area (LTMA) by 1,108 acres and remove three private inholdings. Public access to the Dos Cabezas Mountains Wilderness would be improved through BLM control over lands through which the Happy Camp Canyon Road passes.

- Increase public lands in the Tuzigoot National Monument near Cottonwood, Arizona, by 324 acres.

Table 4-27. Comparison of Federal and Arizona State Mined Land Reclamation Standards

	Federal Reclamation Standards	State Reclamation Standards
Applies to:	Federal lands	Private lands in Arizona
Compliance Officer:	Authorized Officer (AO) at BLM	Arizona State Mine Inspector
Acreage criterion:	Requires reclamation plan for disturbances over five acres	Requires reclamation plan for disturbances over five acres
Acreage exemptions:	Requires reclamation for disturbances under five acres, under FLPMA Section 302(b)	Does not apply to disturbances under five acres
Grandfather clause date:	Applies to mining operations constructed on or after January 1, 1981	Applies to mining operations constructed on or after January 1, 1986
Post-closure reclamation objective:	Requires reclamation plan to be suitable for conditions consistent with BLM land use plans and RMPs	Requires reclamation plan to meet post-mining land use objectives approved by State Mine Inspector
Applicable start-date for reclamation:	Requires reclamation to occur concurrently with mining activity when possible, or else to begin within one year from closure	Requires reclamation to occur concurrently with mining activity when possible, or else to begin within two years of cessation of mining activity
Bonding/ Insurance:	Requires a bond or cash in a Federal depository account to cover reclamation costs	Requires a financial assurance mechanism for reclamation costs (e.g., surety bond)
Reclamation standards:	Includes reclamation standards for waste management, subsurface stabilization, site stability, water management, soil management, erosion prevention, revegetation, visual resources, site protection, and site-specific standards	Includes reclamation standards for waste management, subsurface stabilization, site stability, soil management, erosion prevention, revegetation, site protection, and site-specific standards. Water management standards are covered under the state Aquifer Protection Program.
Compliance review:	Allows the AO to inspect operations periodically to determine compliance	Allows the State Mine Inspector to inspect operations periodically to determine compliance
Public review/ notification:	Provides for public disclosure of the plan through the NEPA analysis of the MPO	Requires public notification prior to approval or major modification of an approved plan

- Consolidate BLM-administered lands in the Southwest Gila Valley LTMA with the acquisition of the 391-acre Norton property; and
- Consolidate BLM-administered lands adjacent to the Gila Box RNCA with the acquisition of the 80-acre portion of the Curtis property that lies outside the RNCA boundary, but with the LTMA.

The public land consolidation that would be achieved by this alternative is consistent with and meets the objectives of the Safford RMP, as amended; the Final Gila Box Plan (BLM 1998); and the Tuzigoot Statement for Management (NPS 1995).

4.4.1.1.2 No Land Exchange Alternative. The No Land Exchange alternative would result in no changes to the existing federal ownership status of public lands by the BLM Safford Field Office. BLM Safford Field Office would continue to manage a complex boundary in the project area created by multiple private inholdings, and additional long-term federal oversight would be required for the mining and reclamation that is expected to occur under the MPO (Proposed Action). The offered lands would remain under PD ownership and management and there would be no public lands consolidation or improved public access in the Gila Box RNCA, the Dos Cabezas LTMA, and Southwest Gila Valley LTMA in the BLM Safford Field Office; in the Empire-Cienega RCA in the BLM Tucson Field Office; or at the National Park Service's Tuzigoot National Monument.

4.4.1.2 Access and Recreation

4.4.1.2.1 Land Exchange Alternative.

- **Selected Lands.** Under this alternative, PD, as landowner of the selected lands, would have the right to restrict public access on roads entering their private property. The BLM would retain an easement for segments of Solomon Pass Road, West Ranch Road, and Salt Trap Tank Road that pass through the selected lands for public and physical access to the Gila Box RNCA and the Gila Mountains. Physical access on PD Mine Road would continue to be restricted to authorized persons at the proposed new security gate. San Juan Mine Road would be closed to the public at the new PD property line; however, the BLM would retain an easement or right-of-access on this road to allow the owners of the Melody Claims (in the event these claims are dropped from the exchange) and allottees to access their mine claims and portions of their allotments, respectively. The BLM would also retain an easement for the spur road leading to the patented Horseshoe Claims from Solomon Pass Road, so that the landowner(s) could continue to access their land under this alternative. No changes to existing physical and public access on the Lone Star Mountain Road are expected.

  Recreational opportunities would be reduced in project vicinity as a result of the land exchange, but these reductions are not expected to significantly affect recreational use of the area. People driving recreationally in the Gila Mountains or heading to Johnny Creek or the Safford-Morenci Trailhead could no longer use San Juan Mine Road. However, public and physical access to these destinations would still be available via Solomon Pass, West Ranch, and Johnny Creek Loop roads. Using these roads instead of San Juan Mine Road would add perhaps 15 to 30 minutes to the drive in some cases, depending on the travel route (S. Knox, BLM, pers. comm.). Closure of San Juan Mine Road may cause some recreationists to go elsewhere, but given the attractiveness of the destinations most affected (Johnny Creek Loop, Johnny Creek, and the Safford-Morenci Trailhead) and the availability of an alternate route to those destinations (Solomon Pass Road), any decrease in recreational use of the area resulting from the road closure is expected to be small. Use of Bonita Creek and the Gila Box RNCA, which are currently accessed via Solomon Pass Road, is not expected to be affected. Overall, if the land exchange alternative is selected, the number of backcountry drivers per year using backroads in the vicinity of the project area is expected to continue in the range of 2,800 to 3,100. The numbers of horseback riders and mountain bike riders using these roads are expected to remain at approximately 75 and 30, respectively (S. Knox, BLM, pers. comm.).

  Under the land exchange alternative, the selected lands would become private property and would no longer be available to hunters on AGFD Hunt Unit 28 or to the four current holders of commercial special recreation permits from the BLM. This restriction in land use is not expected to affect the number of hunters using the general area, nor is it expected to affect the number of commercial special recreation permit holders in the BLM Safford Field Office. The estimated 100 individuals

each year who now hunt deer and javelina on federal and state lands in the project area would likely shift their activity to the deer and javelina habitat available on public lands in the Gila Mountains north of the project area and use Solomon Pass Road to get there. Similarly, the estimated 140 individuals who annually hunt quail and dove, mostly along San Juan Mine Road, would likely shift their hunting to the Solomon Pass area and nearby regions in the Gila Mountains. The four outfitters holding commercial special recreation permits from the BLM Safford Field Office could continue to hold those permits, but would have to move any activities now conducted on the selected lands to other public lands in the region. Portions of the route for the annual Safford Johnny Creek Equestrian Endurance Ride would now cross property that would be acquired by PD through this alternative; the event promoter could negotiate with PD for permission to cross their property, but any routing decision would be governed by PD's safety and security concerns. Participation in the ride is expected to remain in the vicinity of 85-90 riders and 30-40 spectators (S. Knox, BLM, pers. comm.).

The foreseeable uses at the potential Dos Pobres sulfide and Lone Star projects would not affect public and physical access or recreational uses of selected lands beyond those impacts described above.

- **Offered Lands.** Acquisition of the offered properties would improve public access to public lands. In the Gila Box RNCA, acquisition of the Amado and Curtis properties would assure public pedestrian access through about a two-mile reach of Bonita Creek that was formerly private land; acquisition of the Musnicki, Freeland, and Butler-Borg properties improves and further assures public access along the Happy Camp Canyon Road to the north-central part of the Dos Cabezas Mountains Wilderness; acquisition of the Norton property improves public access along Black Rock Wash Road to the San Carlos Apache Reservation; and acquisition of the Feulner, Schock, Clyne I, and Clyne II properties improves general public access in the Empire-Cienega RCA.

  All the offered properties offer dispersed recreational opportunities, including such activities as hiking, mountain biking, backcountry driving, and wildlife/bird watching, among others. The Amado, Curtis, Clyne II, and Tavasci Marsh also offer recreational opportunities associated with perennial water habitats. Developed recreational facilities associated with the Tavasci Marsh Restoration Project (a wildlife/bird watching platform, trails, and signage) would continue to be available at the Tavasci Marsh property. As public lands, the following ten offered properties totaling 3,534 acres would be included in existing AGFD Hunt Units and available for hunting use: Amado, Curtis, Feulner, Schock, Clyne I, Clyne II, Musnicki, Freeland, Butler-Borg, and Norton. Hunting is not allowed in the Tuzigoot National Monument (where the Tavasci Marsh property lies).

4.4.1.2.2 No Land Exchange Alternative. This alternative would not, in itself, cause changes to existing public access or recreational uses of the project area. However, as selection of this alternative would result in BLM authorizing mining on portions of the selected lands per the regulations at 43 CFR 3809, the impacts described under the Proposed Action would also be expected under this alternative.

Under this alternative, the offered lands would remain privately owned and public access to offered lands or to public lands adjacent to these properties, such as to the north-central portion of the Dos Cabezas Mountains Wilderness via Happy Camp Canyon, would not be improved. Furthermore, no developed or dispersed recreational opportunities associated with the offered lands would be available to the public. The Tavasci Marsh property would continue to be managed by AGFD under their cooperative management agreement with PD.

4.4.1.3 Encumbrances

4.4.1.3.1 Land Exchange Alternative.

- **Selected Lands.** PD's acquisition of the selected lands would not affect the seven existing right-of-way agreements, as the exchange would be subject to the conditions of those prior existing encumbrances. However, the foreseeable uses of the selected lands would require rerouting and/or construction of some portions of the electric power lines, telephone/telegraph lines, and radio station site per the approved mine plan. These new or revised rights-of-way would be negotiated directly by PDSI with the existing grantees.

- **Offered Lands.** Public acquisition of the offered lands would be subject to existing rights-of-way, easements, and other encumbrances on titles to the properties. The Clyne II property includes an easement to the grazing leaseholder for a livestock water pipeline and associated roadway; the month-to-month residential lease agreement for the Musnicki property would be terminated if the exchange was authorized. No other encumbrances are known for the offered lands.

4.4.1.3.2 No Land Exchange Alternative. Although this alternative, in itself, would not change the legal rights-of-way or easement agreements that the BLM has made for the selected lands, the mining activities anticipated under this alternative would require modifications to these encumbrances as described under the Proposed Action alternative to accommodate the mine plan. The agreements made between PD and others on the offered lands would not be impacted under this alternative.

4.4.1.4 Agriculture/Grazing

4.4.1.4.1 Land Exchange Alternative.

- **Selected Lands.** No prime or unique farmlands would be impacted by this alternative or by the foreseeable uses of the selected lands. Six BLM grazing allotments would be affected by the exchange. Those portions of selected lands and 24 registered range improvements within the Bryce, Talley Wash, Rest Haven, Bonita, Lone Star, and Johnny Creek allotments would be transferred to PD ownership, with a reduction in BLM grazing receipts corresponding the reduced stocking capacity associated with the public lands (Table 4-28).

Table 4-28. Impacts to Six BLM Grazing Allotments as a Result of the Land Exchange Alternative

Allotment	BLM Land in Allotment Exchanged to PD (acres)	Corresponding reduction in BLM AUMs	Corresponding Reduction in BLM grazing receipts at $1.35/AUM ($/yr)
Bryce	1,723	45	$60.75
Talley Wash	4,338	57	$76.95
Rest Haven	232	0	$0.00
Lone Star	6,348	210	$283.50
Johnny Creek	4,229	325	$438.75
Bonita Creek	124	16	$21.60
TOTAL	**16,994**	**653**	**$881.55**

Data source: C. Templin, BLM, Safford Field Office

For site security and safety reasons and to keep cattle away from operations, PDSI plans to fence a portion of the selected lands around the Project as needed (Figure 4-1). PDSI has indicated that it would lease the selected lands and range improvements outside the security fence to the current allottees for continued grazing use as long as the property is not needed for development of the Dos Pobres sulfide and at Lone Star deposits. Because only a portion of the selected lands would be removed from grazing use by the Project, impacts on grazing are not commensurate with the reduction in BLM-administered land in each allotment. Impacts to BLM grazing income, however, are commensurate with the amount of BLM land removed from each allotment, because revenues generated by grazing leases for those lands would now be paid to PD rather than to BLM.

Impacts to grazing as a result of the foreseeable uses include the impacts described under the Proposed Action alternative in the Mine Plan Alternatives Set, as well as anticipated reductions in the Bryce, Talley Wash, Johnny Creek, Lone Star, and possibly Bonita Creek allotments from future possible mining at the Dos Pobres sulfide and Lone Star projects as summarized in Table 4-29. The data in this table are based on the acreage of each allotment within the three foreseeable use categories and do not consider the security fence that PDSI plans to install around the Project. No adjustment has been made to the acreage for percent disturbance associated with each foreseeable use category.

Table 4-29. Impacts from Foreseeable Uses for the Potential Dos Pobres Sulfide (DPS) and Lone Star (L.S.) Projects on Six Grazing Allotments in the Safford Field Office

Allotment	Production Operations & Support Use Areas (ac)		Transitional Use Areas (ac)		Intermittent Use Area (ac)	TOTAL (ac)
	DPS	*L.S.*	*DPS*	*L.S.*		
Bryce	1,975	0	331	0	4,692	6,998
Talley Wash	1,363	0	227	0	5,562	7,152
Rest Haven	0	0	0	0	226	226
Johnny Creek	118	2,014	63	198	4,436	6,829
Lone Star	0	3,817	0	325	11,107	15,249
Bonita Creek	0	0	0	0	125	125
TOTAL	**3,456**	**5,831**	**621**	**523**	**26,179**	**36,610**

Offered Lands. No existing farmlands would be acquired under BLM management through the exchange. Grazing on the offered lands would be allowed per the applicable management plans. The Tavasci Marsh property would be closed to grazing. Within the Gila Box, those portions of the Amado and Curtis properties in the riparian areas would not be open to livestock grazing, per the proposed management action selected in the Final Gila Box Management Plan (BLM 1998). The Musnicki, Freeland, Butler-Borg, Norton, Schock, Feulner, Clyne I, and Clyne II properties, and portions of the Amado and Curtis properties outside the riparian areas would be open to grazing.

4.4.1.4.2 No Land Exchange Alternative. While this alternative would not, in itself, affect the current use of the project area or the offered lands for grazing. The six allotments in the project area would continue to be grazed at their current stocking rates; PD would likely continue to lease all the offered lands, except Tavasci Marsh, for grazing use. The Amado and Curtis properties, continuing as private inholdings in the Gila Box RNCA, would not be subject to the grazing limitations proposed in the Final Gila Box Plan (BLM 1998); however, vehicle access to these properties for continued grazing use may be reduced as a result of other BLM management actions (ibid.).

4.4.1.5 Mineral Rights

4.4.1.5.1 Land Exchange Alternative.

- **Selected Lands.** As a result of this alternative, PD ownership of federal mineral rights on selected lands would no longer apply. No impact to third-party mineral rights is expected to result from the exchange, which is subject to the existing mineral claims on the selected lands per the Agreement to Initiate (ATI) a Land Exchange (BLM 1994). The selected lands include the approximately 452-acre Melody Claims area; PD is currently negotiating the purchase of those claims from its owners. If no agreement is made prior to preparation of the Final EIS for this Project, the Melody Claims will be dropped from the selected lands and the offered lands package adjusted as necessary.

  No impacts to mineral rights are expected as a result of the potential foreseeable mining uses of the Dos Pobres sulfide and Lone Star area as those areas contain no third-party mining claims.

- **Offered Lands.** Under this alternative, the following properties totaling 2,299 acres would be closed to mineral entry: Tavasci Marsh, all but 80-acres of Curtis, Amado, Schock, Feulner, Clyne I, and Clyne II. A total of 1,559 acres composed of the 80-acre portion of Curtis, Norton, Musnicki, Freeland, and Butler-Borg properties would be open to mineral entry per the Safford District RMP. It should be noted that the metallic mineral potential of the offered lands is low, except for sand and gravel and/or geothermal on some properties (see Tables 3-27, 3-29, 3-31, 3-33, 3-35, 3-37, 3-39, 3-41, 3-42, 3-44).

4.4.1.5.2 No Land Exchange Alternative. This alternative would not affect PD's or third-party mineral rights on the selected lands or on the offered lands. PDSI would retain the right to develop its existing mineral claims to the selected lands through a BLM-approved mining plan of operations, assuming all other environmental permits were secured. Thus, the selection of this alternative, in light of the submitted MPO as the Proposed Action, would result in BLM authorization of the proposed mining of the project area.

4.4.1.6 Surface Water Rights

4.4.1.6.1 Land Exchange Alternative.

- **Selected Lands.** Water rights appurtenant to the selected lands are not affected by the exchange. Individuals who have registered with Arizona Department of Water Resources (ADWR) for a surface water right whose point of diversion or place of use lies on the selected lands would continue to own the water right, regardless of the exchange.[5] For surface water rights registered to BLM or PD, however, BLM and PD agreed to mutually swap these rights associated with the selected and offered lands under this alternative. BLM would relinquish to PD 14 surface water rights totaling 137.1 af/yr that it has registered with ADWR for the selected lands (refer to Table 3-15), including water rights

[5] Access to the newly private land to which the water right applies may have to be negotiated with the new landowners.

whose place of use lies within the footprints of the foreseeable uses at the potential Dos Pobres sulfide and Lone Star projects. Although the exchange represents a significant net gain in BLM water rights (see below), BLM would sustain a net loss of about 136 af/yr of BLM-owned water rights within the Gila River watershed itself (BLM acquires one af/yr on the Amado property and loses 137.1 af/yr on the selected lands). However, no real impact to Gila River flows is expected as a result of the net loss in water rights as the exchange affects only ownership of the right and not its current designated use.

However, the foreseeable mining uses associated with the Dos Pobres/San Juan Project would physically impact 21 surface water rights that lie within the Project boundary fence; these impacts have been accounted for in the calculation of impacts to surface water quantity expected as a result of the Proposed Action alternative. Foreseeable mining uses within Production Operations and Support areas and Transitional Use areas identified for potential mining at Dos Pobres sulfide and Lone Star would impact five surface water rights for a total of 28.31 af/yr on the selected lands.

- **Offered Lands.** Under this alternative, BLM would acquire eight surface water rights totaling 830.17 af/yr, as identified in Table 4-30. This would represent a net gain for BLM of 692.83 af/yr, or roughly five times the surface water rights exchanged to PD. The vast majority of the surface water provided under these water rights (806.5 af/yr or about 97 percent of the total) is appurtenant to Shea Spring, the primary water source for Tavasci Marsh. As described above, BLM loses 136 af/yr within the Gila River watershed.

4.4.1.6.2 No Land Exchange Alternative. This alternative would not affect surface water rights, either physically or legally. All current holders of registered water rights to the project area and to the Gila River or to the offered lands would continue to hold and exercise their surface water rights. However, as mining in the project area would likely be implemented as a result of PD submitting their MPO (Proposed Action) to BLM, impacts to surface water rights identical to those described under the Proposed Action alternative would be expected to occur.

4.4.1.7 Blasting Noise and Vibrations

4.4.1.7.1 Land Exchange Alternative.

- **Selected Lands.** While the exchange itself does not propose blasting and therefore would have no impacts from noise and vibrations associated with blasting, the foreseeable uses of the selected lands associated with the Dos Pobres San Juan Project would result in noise and vibrational impacts identical to those described in Section 4.3.1.7.1 for the Proposed Action alternative. Although no specific blasting activities have been proposed for the potential foreseeable mining uses of the Dos Pobres sulfide or the Lone Star area, it is expected that the noise and vibrations associated with future blasting that could be heard or felt at Mt. Graham or in Safford would be similar in magnitude to those of the Proposed Action alternative. These would probably occur during the latter period of the Dos Pobres/San Juan Project, when blasting at the Dos Pobres Mine has stopped. Therefore, depending on the timing of these projects, the total number of daily blasts on the selected lands could increase or decrease slightly.

- **Offered Lands.** No blasting noise and vibrational impacts would affect the offered lands under this alternative.

Table 4-30. Surface Water Rights on the Offered Lands That Would Be Acquired by BLM

Offered Property	Registration Number	Place of Use	Holder	Water Source	Specified Use[1]	Quantity[2]
Base Package						
Amado	4A-0004782 0001	T5S R27E Sec 10 SW NE T5S R27E Sec 3 NE SW	PD Corporation	Bonita Creek	S	1.00 af/yr
Feulner	36-0064893	T18S R18W Sec 5 NW SE	PD Corporation	Upper Coyote Spring	S	3.00 af/yr
Musnicki	36-0065222	T14S R28E Sec 9 SE SE[3]	PD Corporation	Ninemile Creek	I, D, S	15.00 af/yr
Optional Package						
Norton	36-0002041	T5S R23E Sec 30 NE NE	PD Corporation	Black Rock Wash	S, W	0.30 af/yr
Clyne I	36-0019771 0001	T19S R18E Sec 10 NE SW	PD Corporation	Bear Spring Canyon	S	2.00 af/yr
Clyne II	33-0030167 0001	T19S R18E Sec 21 SW NE SE	PD Corporation	Mud Spring	W	0.37 af/yr
	36-0029484 0001	T19S R18E Sec 22 NE NW	PD Corporation	Mud Springs Canyon	S	2.00 af/yr
Tavasci Marsh	36-0025460	T16N R3E Sec 15 NE SW[4]	PD Corporation	Shea Spring	I, W	806.50 af/yr
					TOTAL	**830.17 af/yr**

[1] Specified Use: A=Irrigation, C=Commercial, D=Domestic, I=Industrial, M=Municipal, S= Stock, W= Wildlife, X=Mining.
[2] af/yr = acre-feet per year, gpa = gallons per annum. 1 acre-foot = 325,851 gallons.
[3] The legal description of this surface water right is not specific enough to ensure that this right is actually on the Tavasci Marsh property.
[4] Point of diversion (place of use not available). While surface water rights are attached to place of use, and therefore the point of diversion has no effect on water rights, the place of use and point of diversion are often the same, especially for "36-" water rights (ADWR 1995b).

4.4.1.7.2 No Land Exchange Alternative. This alternative does not, in itself, propose any activities that would result in noise or vibrational impacts to either the selected or offered lands. However, as mining is expected to occur under this alternative, noise and vibrational impacts identical to those described for the Proposed Action alternative would be anticipated.

4.4.1.8 Visual Resources

4.4.1.8.1 Land Exchange Alternative.

- **Selected Lands. Under this alternative,** BLM's VRM class objectives would not apply to mining activities on private lands The exchange itself would not impact visual resources of the selected lands; however, the foreseeable uses of the selected lands would modify the landscape to a considerable extent. The uses associated with the Dos Pobres/San Juan Project would result in impacts identical to those described under the Proposed Action alternative, and potential development of the Dos Pobres sulfide and Lone Star projects would amplify and extend those

impacts. Developing the Dos Pobres Sulfide orebody would mean continuing traditional open pit mining, continuing to process ore with the SX/EW method, and expanding the mine-for-leach pit at Dos Pobres. Conventional concentrating processes would be used as well. These processes require a primary crusher, a semi-autogenous (SAG) mill (composed of ball mills and flotation trains), and storage of concentrate, and they create tailings. Mining the Lone Star oxide orebody would likely involve the same SX/EW process as the proposed for the Dos Pobres/San Juan Project, including creation of a leach pad and development rock stockpiles.

These foreseeable mining uses would alter the landscape of the Gila Mountains and its southern flank, affecting the silhouette of Lone Star Mountain. Contrasting light colors from the tailings and unnaturally regular horizontal and diagonal lines associated with a tailings impoundment and processing facilities are likely to be visible from many points in the Safford Valley. The massing effect of the three mines across the base of the Gila Mountains would create a zone below the horizon of large-scale, mesa-like or terrace-like forms, with various structures, roads, and contrasting colors visible.

Offered Lands. The visual resources of the offered lands would become a resource managed by the BLM (or by NPS for Tavasci Marsh) under the land exchange alternative. The visual resources of the Tavasci Marsh, Amado, and all but 80 acres of the Curtis property would be managed to preserve the existing character of the landscape. The visual resources of the 80-acre portion of Curtis, Musnicki, Feulner, Schock, Freeland, Butler-Borg, Clyne I, and Clyne II properties would be managed to partially retain the existing landscape character; the visual resources of the Norton property would be managed to provide for major modification of the existing character of the landscape.

4.4.1.8.2 No Land Exchange Alternative. This alternative, in an of itself, would not affect visual resources management in the project area. BLM would continue to manage public lands in the project area per the applicable visual resource management objectives. However, in light of the Proposed Action alternative and BLM's requirements under 43 CFR 3809, the mining that is expected to occur under this alternative would likely result in visual resource impacts identical to those described under the Proposed Action alternative. Visual resources on the offered lands would be subject to management by PD; VRM classifications of adjacent or nearby public lands would not apply.

4.4.1.9 Hazardous Materials

4.4.1.9.1 Land Exchange Alternative.

- **Selected Lands.** Per the Resource Conservation and Recovery Act of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, BLM required a Phase I Environmental Assessment of the selected lands and offered lands. Under this alternative, an unquantified portion of the San Juan zipACIDS site which lies on BLM selected lands would be exchanged to PD (Zenitech 1998a). PD is aware of this disclosure, would accept the liability associated with acquiring this portion of the selected lands, and has already initiated clean-up activities at the San Juan zipACIDS site, including the portion that lies on the selected lands. The foreseeable mining uses of the selected lands would eliminate the San Juan site as the mine is developed. As discussed under Section 4.3.1.9.1, the potential risk for impacts from a release of hazardous materials would be increased due to the transport, use, and storage of such materials on the mine site, however, PDSI's Spill Containment and Pollution Prevention Plan and use of BADCT design standards should minimize that potential.

- **Offered Lands.** There are no known hazardous materials sites on the offered lands and acquisition of the eleven offered properties would bring no known hazardous materials sites into public ownership (Zenitech 1998b).

4.4.1.9.2 No Land Exchange Alternative. This alternative, in and of itself, would not affect hazardous materials and neither increase nor decrease the BLM's liabilities for hazardous materials sites on public lands. However, given that mining would likely occur on portions of the selected lands, impacts identical to those described under the Proposed Action for hazardous materials are anticipated. This alternative would have no effect on the offered lands.

4.4.2 Physical Resources, Including Waters of the U.S.

4.4.2.1 Climate

4.4.2.1.1 Land Exchange Alternative

- **Selected Lands.** The land exchange alternative itself would not physically affect climate, either directly or indirectly. Potential impacts to climate, if any, would result solely from foreseeable mining uses of the selected lands, as described in Section 4.3.2.1.1 in the Mine Plan Alternatives Set. Based on the conceptual foreseeable uses described for the potential Lone Star and Dos Pobres sulfide projects, on-site wind patterns on the selected lands would likely change as a result of large-scale changes in topography from construction of mine facilities such as open pits or cuts, leach pads, and development rock stockpiles. These impacts, if they occur, would likely be long term but localized.

- **Offered Lands.** Neither the exchange itself nor the foreseeable uses of the offered lands is expected to affect local or regional climate.

4.4.2.1.2 No Land Exchange Alternative. This alternative would have no impact to existing climate of either the selected or offered lands. The anticipated mining activities that would likely occur on portions of the selected lands would result in impacts to local wind patterns identical to those described under the Proposed Action alternative.

4.4.2.2 Air Quality (Criteria Air Pollutants and Class I Airsheds)

4.4.2.2.1 Land Exchange Alternative.

- **Selected Lands.** The land exchange *per se* would not generate any criteria air pollutants or affect Class I airsheds within 100 km of the selected lands. However, the proposed foreseeable uses of the selected lands include mining construction and operational activities that would generate emissions subject to Clean Air Act requirements.

  The potential impacts to criteria pollutants and to Class I airsheds for the specific foreseeable uses proposed at the Dos Pobres/San Juan Project are described in Section 4.3.2.2.1. Although only conceptual plans are known at this time for the foreseeable uses at the Dos Pobres sulfide project, the anticipated activities that involve traditional ore concentrating methods (i.e., tailings, concentrator) may result in emissions of criteria pollutants that would classify the project as a major new source, thereby requiring compliance with a Class I air quality permit, regardless of private land status. Compliance would mandate no exceedances of air quality standards, however, an increase in ambient concentrations of criteria pollutants such as PM_{10} would likely result. The potential

foreseeable uses at the Lone Star project, however, would probably be similar in types of emissions to the Dos Pobres/San Juan Project, which has been classified as a minor source requiring a Class II air quality permit (Class One Technical Services 1997). ADEQ's source determination for these potential projects, if implemented, would be based on the level of point source emissions for all regulated pollutants, as defined by ADEQ. For major sources only, ADEQ requires an air quality impact analysis on Class I airsheds located within 100 km of the process boundary (ibid.).

- **Offered Lands.** Neither the land exchange nor the foreseeable uses of the offered lands would generate criteria air pollutants subject to Clean Air Act requirements. No impacts on Class I airsheds are expected from the federal acquisition or foreseeable uses of the offered lands.

4.4.2.2.2 No Land Exchange Alternative. This alternative, in and of itself, would not change existing conditions for air quality, criteria pollutants, or Class I airsheds on either the selected or offered lands. However, as mining would likely occur, the impacts to air quality, criteria pollutants, and Class I airsheds as described under the Proposed Action would be expected.

4.4.2.3 Geology

4.4.2.3.1 Land Exchange Alternative. The primary geological resource of concern to this analysis is the economic mineral potential of the exchange lands.

- **Selected Lands.** The mineral potential of the selected lands has been included in the appraised value of the selected lands. While the economic mineral potential would not be directly or indirectly affected by the exchange itself, the foreseeable uses of the selected lands involve mining of the metallic mineral deposits (copper) found therein as well as on-site use of common variety minerals such as sand, gravel, decomposed granite, aggregate, and rock suitable for riprap. Thus, the metallic and common-variety mineral potential of portions of the selected lands would be largely reduced as the foreseeable uses are implemented as described in Section 4.3.2.3.1. The long-range foreseeable uses at the potential Dos Pobres sulfide and Lone Star projects would likely include use of common variety minerals that may occur within Intermittent Use areas of the selected lands as part of construction and mine development activities for those projects; the sulfide and oxide orebodies associated with these potential projects are located on existing PD private lands.

- **Offered Lands.** If acquired into public ownership, five of the offered properties, or portions thereof, would be open to mineral entry under this alternative. The properties that would be open to mineral entry are Musnicki, Freeland, Butler-Borg, Norton, and 80-acres of Curtis that lie outside of the Gila Box RNCA boundary. Of these properties, all have low mineral potential for coal, oil, gas, sodium, potassium, uranium, thorium, geothermal resources, metallic minerals, non-metallic and industrial minerals, and common variety minerals, with the following exceptions: Freeland and Butler-Borg were classified as having moderate mineral potential for common variety minerals and Norton was evaluated as having moderate mineral potential for geothermal resources. For the six properties with low economic mineral potential, it is unlikely that mining claims would be filed for their mineral resources; the mineral resources of the Freeland, Butler-Borg, and Norton properties could become encumbered under the General Mining Law of 1872, FLPMA, and other public lands mineral regulations. The Tavasci Marsh, Schock, Feulner, Clyne I and Clyne II properties would be closed to mineral entry.

4.4.2.3.2 No Land Exchange Alternative. This alternative would not affect existing mineral resources in the selected lands or on the offered lands. The mineral resources on the selected lands would still be controlled by PD through their mining claims, and through submittal of their MPO (the Proposed Action), are expected to be developed as described under the Proposed Action alternative. As private lands, the offered

lands mineral resources could be developed without federal oversight to the degree that such activities are allowed without a federal permit.

4.4.2.4 Soils

4.4.2.4.1 Land Exchange Alternative.

- **Selected Lands.** The land exchange itself would not affect soils; however, the foreseeable mining uses of the selected lands would. These effects for the Dos Pobres/San Juan Project are described in Section 4.3.2.4.1. For the selected lands identified for Production Operations and Support and Transitional Uses for the potential Dos Pobres sulfide and Lone Star projects, the area's low productivity soils would be similarly disturbed by expansion of the Dos Pobres pit and mining of the Lone Star pit, construction of new or expanded leach pad areas, and construction of new mining support facilities like a tailings impoundment, a concentrator, and new roads and stormwater management facilities. Some stockpiling of soils for reclamation uses would be anticipated and on-site erosion would be controlled in a manner consistent with safety and operational requirements.

- **Offered Lands.** This alternative is not expected to directly affect the soil resources of the offered lands. BLM erosion control practices may be implemented on an as-needed basis for properties or portions thereof in which soil erosion may be affecting public access, public safety, or other natural resources.

4.4.2.4.2 No Land Exchange Alternative. The soils of the selected lands and of the offered lands would not be impacted by this alternative, in and of itself. However, soils impacts as described by the Proposed Action would be expected as a result of BLM's subsequent authorization of a mine plan.

4.4.2.5 Groundwater

4.4.2.5.1 Groundwater Quantity.

- **Land Exchange Alternative.**

  - **Selected Lands.** The land exchange itself would not impact groundwater quantity. Based on the hydrogeologic model prepared for the Project, the foreseeable uses of the selected lands as described by the Proposed Action would result in impacts to groundwater quantity as discussed in Section 4.3.2.5.1. As BLM oversight for mining would be removed under this alternative, federal oversight to ensure mitigation for these impacts as described in Appendix F would be included in the COE's 404 permit. These include creation of a cone of depression emanating outward from the production well field and from the Dos Pobres and San Juan pits that reflects a long-term reduction of the volcanic aquifer's groundwater surface elevation. It is anticipated that the same aquifer for the Dos Pobres/San Juan Project would also be used to supply process and make-up water for the potential Production Operations and Support uses at the Dos Pobres sulfide and Lone Star projects; the pumpage necessary for these potential projects, however, has not been quantified. Continued pumping of the volcanic aquifer would extend and increase the long-term impacts to groundwater quantity beyond those predicted for the Dos Pobres/ San Juan Project, but at this time, it is not possible to quantify the amount or temporal extent of the additional anticipated impacts. As implementation of these foreseeable uses on private lands in the future would still require compliance with Section 404 and NPDES permit requirements, the

extent of these impacts to the regional groundwater system would be evaluated by either or both the COE and EPA under a separate NEPA analysis at that time.

- **Offered Lands.** The Land Exchange alternative is not anticipated to impact regional groundwater systems of the offered lands.

- **No Land Exchange Alternative.** Retaining the selected lands in public ownership would not affect the existing regional groundwater system. However, groundwater impacts from mining as described in the Proposed Action are expected with BLM's subsequent authorization of a mine plan alternative. Groundwater quantity on the offered lands would also remain the same as the existing conditions.

4.4.2.5.2 Groundwater Quality.

- **Land Exchange Alternative.**

  - **Selected Lands.** The land exchange is not expected to impact groundwater quality either directly or indirectly. The foreseeable uses, however, involve mining activities and production facilities that are subject to regulation under the State of Arizona's Aquifer Protection Program (APP) administered by ADEQ. Based on APP requirements, mining activities under the Dos Pobres/San Juan Project (Proposed Action alternative) are not expected to impact existing groundwater quality at or beyond the points of compliance that are identified in PDSI's APP permit application. Use of liner systems for the leach pad, excess process solution impoundment, and stormwater impoundment; stormwater impoundment sized for the 100-year, 24-hour storm event and 24-hour power outage; double containment systems for the SX/EW tankhouse facilities; and other environmental protection measures are applications of best available demonstrated control technologies (BADCT) used in the Project to maximize protection of groundwater quality.

    The potential future foreseeable uses at the Dos Pobres sulfide and Lone Star projects would also be subject to APP requirements for groundwater protection; therefore, no impacts to the regional groundwater quality at or beyond the applicable points of compliance would be expected.

  - **Offered Lands.** The land exchange is not anticipated to affect the regional groundwater quality of the offered lands.

- **No Land Exchange Alternative.** The No Action alternative, in and of itself, would not impact existing groundwater quality of either the selected or the offered lands. However, impacts to groundwater quality identical to those described for the Proposed Action are expected as a result of the subsequent authorization of a mine plan alternative.

4.4.2.6 Surface Water

4.4.2.6.1 Surface Water Quantity.

- **Land Exchange Alternative.**

  - **Selected Lands.** The land exchange would not impact surface water quantity of the selected lands either directly or indirectly. The foreseeable mining uses of the selected lands are predicted to result in the surface water quantity impacts discussed under the Proposed Action alternative in Section 4.3.2.6.1 in the Mine Plan Alternatives Set. These long-term impacts include a maximum impact to Gila River flows of about 75.4 af/yr by Year 416, as a result of the effects of both the cone of depression as well as the permanent retention of appropriable surface waters (for stormwater management) that are tributary to the Gila River. Over time, the total volume of flow captured from the Gila River is expected to approach the total volume of water pumped by the Project (MacNish 1998).

    For the foreseeable uses at Dos Pobres sulfide and Lone Star, it is anticipated that surface water flows in Production Operations and Support Areas would be retained on-site as part of a stormwater management program yet to be developed. Surface flows in the Gila River may also be captured as a result of the effects of continued groundwater pumping for the two potential projects. No quantification has been made of these potential, long-term impacts to surface flows to the Gila River and its tributaries.

    For the foreseeable uses at the Dos Pobres/San Juan Project, the groundwater model predicts impacts to flows in Bonita Creek by Year 90 of a maximum of less than one af/yr, a value that is at or below the accuracy of the model (Dames & Moore 1997h). However, as these future potential projects would be subject to federal permitting under Sections 404 and 402 of the Clean Water Act by COE and EPA, respectively, such impacts would be quantified and evaluated under a separate NEPA analysis prepared by one or both agencies.

  - **Offered Lands.** The surface flows of drainages on the offered lands would not be impacted by the land exchange.

- **No Land Exchange Alternative.** This alternative, in and of itself, would not affect existing surface water quantity on either the selected or the offered lands. However, surface water quantity impacts resulting from the subsequent authorization of a mine plan would be expected and would be identical to those described for the Proposed Action alternative.

4.4.2.6.2 Surface Water Quality.

- **Land Exchange Alternative.**

  - **Selected Lands.** The lands exchange itself would not impact surface water quality of the selected lands. Implementation of the foreseeable uses for the Dos Pobres/San Juan Project includes measures in compliance with Section 402 of the Clean Water Act to protect surface water quality. Stormwater that comes into contact with mine facilities is not expected to leave the mine site and facilities have been designed to entrain stormwater that falls on-site within the mines' process and make-up water systems. Foreseeable Production Operations and Support Uses at the potential Dos Pobres sulfide and Lone Star projects

would also be subject to Section 402 requirements that would assist in protecting quality of surface waters off the mine site.

The sediment transport characteristics of drainages in the Dos Pobres/San Juan Project altered for stormwater management would change as described in Section 4.3.2.6.2. For the Dos Pobres sulfide and Lone Star projects, foreseeable uses in Production Operations and Support Areas and in Transitional Areas, it is anticipated that additional drainages within the selected lands would be altered as part of stormwater management activities for those future potential projects. Therefore, sediment transport characteristics would also be expected in diverted and recipient drainages, although the extent of those impacts cannot be quantified at this time.

- **Offered Lands.** No impacts to the surface water quality of the offered lands are anticipated as result of the land exchange. Public management of the Tavasci Marsh property and the Curtis and Amado properties on Bonita Creek would continue to maintain the existing water quality of the aquatic habitats on those lands.

▸ **No Land Exchange Alternative.** This alternative, in itself, would not affect existing surface water quality of either the project area or of the offered lands. However, the subsequent mining that would occur resulting from BLM's selection of a mine plan alternative would result in impacts identical to those described for the Proposed Action alternative.

4.4.2.6.3 Pit Lakes

▸ **Land Exchange Alternative.**

- **Selected Lands.** The land exchange itself would not directly or indirectly result in creation of pit lakes. The foreseeable mining at the Dos Pobres/San Juan Project would result in formation of permanent pit lakes at the Dos Pobres and San Juan pits as described in Section 4.3.2.6.3. Implementation of the foreseeable uses at the possible Lone Star project would also create a pit lake whose water chemistry and ultimate size/depth cannot be determined at this time. If the foreseeable uses at the Dos Pobres sulfide project are implemented, the Dos Pobres pit would be expanded to mine the sulfide ores. The Dos Pobres pit lake under this alternative would be expected to form sometime after completion of the potential Dos Pobres sulfide project. No projections have been made as to the water chemistry and ultimate size/depth of pit lake formed after the Dos Pobres sulfide project; however, because the foreseeable uses at the Dos Pobres sulfide and Lone Star projects would be subject to Section 404 and 402 permitting in the future, the potential pit lake impacts would be characterized, quantified, and evaluated at that time.

- **Offered Lands.** None of the foreseeable uses of the offered lands would result in creation of a pit lake.

▸ **No Land Exchange Alternative.** Under this alternative, the existing water quality of the San Juan pit lake would not change and no pit lake would be expected at Dos Pobres since no further development of that orebody would occur. However, in selecting this alternative, BLM would have to make a subsequent decision regarding one of the mine plan alternatives, therefore, the pit lake impacts described under the Proposed Action alternative would be expected to occur.

4.4.2.6.4 100-year Floodplains

- **Land Exchange Alternative.**
  - **Selected Lands.** Under this alternative, PD would manage some lands within the FEMA-designated 100-yr floodplain of the Gila River. No other direct or indirect impacts to 100-yr floodplains in the vicinity of the project area are expected. The anticipated changes in the hydrologic regimes of several washes on the portions of the selected lands affected by the foreseeable uses at the Dos Pobres/San Juan Project are also not expected to impact 100-yr floodplains (see Section 4.3.2.6.4). Implementation of foreseeable uses at the potential Dos Pobres sulfide and Lone Star projects would also be expected to change the hydrologic regimes of washes directly or indirectly affected by stormwater management operations. At this time, however, no specific facilities have been designed and it is not possible to evaluate the extent of these impacts, if any, on 100-yr floodplains in the project vicinity. Given the distance of these potential impacts from the Gila River and the Graham County landfill, it is likely that washes with increased flows would recover from the increased effects of scour some distance upstream of the 100-yr floodplain boundaries of the Gila River. Therefore, no changes to 100-yr floodplains delineated by FEMA are expected.
  - **Offered Lands.** The 100-yr floodplains on the offered lands would come under BLM management and protection. The land exchange would have no other direct or indirect impacts on 100-yr floodplains of drainages near the offered lands.

- **No Land Exchange Alternative.** This alternative, in itself, would not change the hydrologic regimes of washes or the 100-year floodplain of the Gila River, nor would the Graham County landfill near the confluence of Cottonwood and Peterson washes be affected under this alternative. However, as selection of this alternative requires BLM to select a mine plan alternative, impacts to 100-yr floodplains identical to those described under the Proposed Action would be expected to occur.

4.4.2.6.5 Waters of the U.S.

- **Land Exchange Alternative.**
  - **Selected Lands.** The land exchange would not directly or indirectly affect waters of the U.S., as the COE's jurisdiction of WUS extends to both private and public lands. However, the foreseeable uses of portions of the selected lands for the Dos Pobres/San Juan Project would result in the impacts described in Section 4.3.2.6.5. The foreseeable Production Operations and Support Uses, Transitional Uses, and Intermittent Uses of the remainder of the selected lands for the Dos Pobres sulfide and Lone Star projects would also impact waters of the U.S., although no formal delineation has been completed for these areas so no estimate of potential acres of impact can be calculated. As these two potential projects on the selected lands would still be subject to federal permitting under the Clean Water Act if PD acquires the land, the impacts to waters of the U.S. would be determined at the time PDSI applies for Section 404 and/or Section 402 permits from the COE and EPA, respectively.
  - **Offered Lands.** No potential waters of the U.S. on the offered lands would be affected by the land exchange. Any potential BLM activities that would impact waters of the U.S. would be subject to Clean Water Act Section 404 compliance with the COE.

- **No Land Exchange Alternative.** This alternative in itself would not result in impacts to waters of the U.S., however, impacts from mining that are expected occur under this alternative would be identical to those described for the Proposed Action alternative.

4.4.3 Biological Resources

4.4.3.1 Vegetation

4.4.3.1.1 Land Exchange Alternative.

- **Selected Lands.** The proposed land exchange, *per se*, would not physically impact vegetation on the selected lands. However, foreseeable uses of the traded selected lands are expected to physically impact vegetation. Direct effects of the Dos Pobres/San Juan Project on vegetation communities are described in detail under the impact assessment for the Proposed Action alternative. Activity related to the more distant Dos Pobres sulfide and Lone Star projects is expected to impact four vegetation community types (Sonoran Desertscrub, Semidesert Grassland, Sonoran Desertscrub-Semidesert Grassland Ecotone, and Disturbed Land--see Table 4-31), which would now be subject to private management under PD ownership. The total acreage impacted in each habitat community in Table 4-31 reflects the varying 5 to 100 percent disturbance assumptions for each foreseeable use category as identified at the beginning of this chapter. These acreages are rough approximations based on generalized footprints of the Dos Pobres sulfide and Lone Star projects depicted in Figure 2-23.

- **Offered Lands.** Federal acquisition of the 11 offered properties would bring a wide range of desirable vegetation resources into public ownership and under the management of the BLM and the NPS. These resources include perennial water and associated riparian/wetland habitats on the Amado, Curtis, Clyne II, and Tavasci Marsh properties, as described in Chapter 3; xeroriparian habitat on all the properties; and upland habitats consisting of Sonoran Desertscrub, Semidesert Grassland, Oak Woodland, and Crucifixion Thorn-Juniper-Creosotebush Association. Together, these vegetation communities provide habitats for diverse wildlife, contribute visual character and variety to the landscape, and offer dispersed recreational opportunities to the public.

4.4.3.1.2 No Land Exchange Alternative. Under this alternative, BLM would not dispose of the vegetation habitats on the selected lands nor acquire and manage the riparian/wetland, xeroriparian, and upland habitats of the 11 offered properties. In the short term, this alternative would result in no impacts to vegetation resources on either selected or offered lands. Over the long term, however, because PDSI has submitted an MPO to the BLM, it is reasonable to assume that mining activities would proceed on portions of the selected lands, and impacts of that mining are likely to be the same as those described under the Proposed Action alternative.

4.4.3.2 Wildlife Resources

4.4.3.2.1 Land Exchange Alternative.

- **Selected Lands.** All wildlife within the state, regardless of land ownership, is under the jurisdiction of the State of Arizona and managed by the Arizona Game and Fish Department (AGFD) per ARS 17-102. PD ownership of the selected lands would not change this jurisdiction, although private ownership would allow PD to prohibit hunting on the selected lands in AGFD Hunt Unit 28.

Table 4-31. Calculated Acreage of Impacts on Vegetation Communities on the Selected Lands by Foreseeable Use Category

Vegetation Community Type	Dos Pobres/San Juan Project (Proposed Action) Area Impacted (100%)	Dos Pobres Sulfide (DPS) / Lone Star (LS) Projects: Production Operations and Support Areas Impacted (100%)	Transitional Use Areas Impacted (25%)	Intermittent Use Areas Impacted (5%)	TOTAL IMPACTED AREA (acres)
Sonoran Desertscrub	529	221	19	731	1,500
Semidesert Grassland	0	506	29	150	685
Sonoran Desertscrub-Semidesert Grassland	1,222	997	41	409	2,669
Disturbed	184	0	1	24	209
TOTAL	**1,935**	**1,724**	**90**	**1,314**	**5,063**

In the near future, the impacts to wildlife on the selected lands as result of foreseeable uses would be the same as impacts described under the Proposed Action alternative. In the more distant future, projected potential impacts resulting from the Dos Pobres Sulfide and Lone Star projects include loss of habitats and a corresponding impact to two game species as shown in Table 4-32. Figures given for the species are based on AGFD density estimates.

Table 4-32. Estimated Number of Mule Deer and Javelina Impacted by Foreseeable Uses of the Selected Lands

Foreseeable Uses	Total BLM Lands Potentially Impacted		Corresponding Range of Potential Impacts to Mule Deer and Javelina Densities (based on AGFD density estimates)	
	acres	sq mi	Mule Deer (4 to 7/sq mi)	Javelina (1.5 to 3/sq mi)
Dos Pobres/San Juan Project (Proposed Action) (100%)	1,935	3.02	12 to 21	5 to 9
Dos Pobres Sulfide/Lone Star Projects				
Production Operations & Support Use Areas (100%)	1,724	2.69	11 to 19	4 to 8
Transitional Use Areas (25%)	90	.14	< 1 to 1	<1
Intermittent Use Areas (5%)	1,314	2.05	8 to 14	3 to 6
TOTAL	**5,063**	**7.91**	**32 to 55**	**12 to 24**

- **Offered Lands.** Because the diversity of habitats on the offered lands, including some valuable riparian areas, is greater than on the selected lands, diversity of wildlife species on property coming into public ownership would be greater than diversity on property leaving public ownership. Habitats on offered lands include types that may support BLM priority species such as bighorn sheep (in Bonita Creek), black bear, mule deer, quail, dove, javelina, and mountain lion. Though these lands would become federal and be managed by the BLM or the NPS, wildlife itself would remain the property of the state and be under the jurisdiction of the AGFD.

4.4.3.2.2 No Land Exchange Alternative. This alternative would have no immediate effects on wildlife, which would remain under the jurisdiction of the AGFD on both the selected and offered lands. Over the long term, it is reasonable to assume that mining under a BLM-authorized MPO would proceed on portions of the selected lands. Impacts of that mining are likely to be the same as those described under the Proposed Action alternative.

4.4.3.3 Special Interest Species

4.4.3.3.1 Threatened and Endangered Plants.

- **Land Exchange Alternative.** The only effect of the proposed land trade on federally listed, proposed, or candidate plant species would be a change in required consultation procedures for proposed actions. Section 9 of the ESA prohibits a person from removing, taking possession of, or maliciously destroying or damaging an endangered plant on areas under federal jurisdiction. These proscriptions do not apply to endangered plants on private or state property that is not subject to federal jurisdiction. Protection of listed plant species on such property is limited to the extent afforded by the pertinent state law—in this case, the Arizona Native Plant Law.

  - **Selected Lands.** Under the Land Exchange alternative, the selected lands would become private lands, and activities affecting federally listed, proposed, or candidate plant species occurring on the property would no longer be subject to BLM review or Section 7 consultation by BLM. Under the ESA, in the absence of federal jurisdiction, protection of such species on private lands would be limited to that afforded by the Arizona Native Plant Law, which requires property owners to notify the Arizona Commission of Agriculture and Horticulture of planned clearing activities (except for activities that occur in the normal course of mining, which are exempt from the notification requirement under ARS Ch.7, Article 1, Sec.3-904 [G] 1993). Since it is highly likely, however, that any foreseeable mining uses on the selected lands undertaken by PDSI that would potentially impact an endangered plant would require one or more federal permits (such as a Section 404 or 402 permit from the COE or EPA, respectively), such activities would by subject to Section 7 consultation with USFWS, regardless of private land status.

    At this time, no definitively identified federally listed, proposed, or candidate plant species are known to occur on the selected lands. However, approximately 1,600 individual plants of the undetermined hedgehog cactus *Echinocereus* sp. are estimated to occur on approximately 1,950 acres of potentially suitable habitat on the selected lands. Until the relationship of *Echinocereus* sp. to the endangered Arizona hedgehog cactus is resolved, the BLM and the USFWS are treating *Echinocereus* sp. on the selected lands as if it were the listed species. Therefore, because the proposed land exchange constitutes a major federal action, and because that action would affect *Echinocereus* sp. on the selected lands by removing it from federal protection under the ESA, the BLM is undertaking a Section 7 consultation with the USFWS for the species before the exchange can be approved.

The foreseeable uses of the selected lands associated with the Dos Pobres\San Juan Project are not expected to physically impact either *Echinocereus* sp. or its habitat. All planned mine facilities are sited below the elevations at which this cactus and its potentially suitable habitat have been observed (SWCA 1997a). However, more distant foreseeable uses, specifically development of the Lone Star deposits, are likely to impact *Echinocereus* sp. and its habitat on selected lands. The extent of this potential impact can be estimated only roughly at this time because plans for the Lone Star Mine have not advanced beyond a generalized footprint. Within this footprint, an estimated 400 plants on roughly 500 acres of potentially suitable habitat on the selected lands could be affected. Federal permitting for this foreseeable use would require Section 7 consultation with the USFWS.

- **Offered Lands.** No federally listed, proposed, or candidate plant species are known to occur on the offered lands; the cactus morphologically similar to the endangered Arizona hedgehog cactus has been identified by BLM as occurring on the Curtis and Amado properties. However, if listed plant species were to be found after the offered lands had passed into public ownership, the species would be managed by the BLM (all offered properties except Tavasci Marsh) or the NPS (Tavasci Marsh) and would receive federal protection under the Endangered Species Act.

- **No Land Exchange Alternative.** In the short term, this alternative would result in no impacts to federally listed, proposed, or candidate plant species on either the selected lands or the offered lands. On the selected lands, *Echinocereus* sp. would remain under BLM management, and any action potentially affecting the cactus would be subject to Section 7 consultation by BLM (unless the USFWS determines that *Echinocereus* sp. is not protected by the ESA). Over the longer term, it is reasonable to assume that mining activities would proceed on portions of the selected lands. Impacts of that mining are likely to be identical to those described under the Proposed Action alternative. The offered lands would remain under private ownership. Protection afforded any federally listed, proposed, or candidate plant species, such as the cactus on Curtis and Amado properties that is morphologically similar to the Arizona hedgehog cactus (endangered), found on the offered properties would be limited to that provided by the Arizona Native Plant Law, unless a federal jurisdiction (via a permit or other federal action) is involved.

4.4.3.3.2 Threatened and Endangered Animals.

- **Land Exchange Alternative.** As with listed plant species, the proposed land trade would affect any federally listed, proposed, or candidate animal species on the selected or offered lands by changing required consultation procedures for proposed actions. However, the change in those procedures would be different for listed animals than for listed plants. Unlike the protection for listed plant species, protection for animal species under Section 9 of the ESA is the same whether the subject land is federal or non-federal. Section 7 of the ESA applies not only to all actions on federal lands but also to federal actions on non-federal lands (such as issuance of a federal permit). The federal agency issuing the permit would have to consult with the USFWS to identify, if possible, ways for the proposed action or an alternative action to proceed without violating Section 9 and jeopardizing the continued existence of the subject species.

- **Selected Lands.** Under this alternative, the selected lands would become the property of PD, and actions potentially affecting federally listed animal species would no longer be subject to BLM review or Section 7 consultation by the BLM. However, any proposed activity requiring a federal permit or other federal action potentially affecting listed animals would be subject to Section 7 consultation by the agency permitting the activity. PD has indicated that its foreseeable uses of the selected lands would be mining, and mining would require one or more federal permits, such as a Clean Water Act Section 404 permit and/or a National Pollutant Discharge Elimination System (NPDES) permit. These permits, in turn, would require the lead federal agency (either COE or EPA) to comply with all applicable provisions of the ESA prior to issuing the permit. Thus, the most likely management effect of the federal lands becoming private would be that one or more federal agencies would still be responsible for protecting listed animal species under Section 7 of the ESA.

  The likely physical effects of the foreseeable uses associated with the Dos Pobres/San Juan Project would be the same as those resulting from the Proposed Action alternative. Development of the Dos Pobres sulfide and Lone Star deposits could indirectly affect listed animal species with suitable habitat along the Gila River if stormwater diversions and groundwater pumping impacted river flow. These species are the bald eagle, southwestern willow flycatcher, and cactus ferruginous pygmy owl. Development of the Dos Pobres sulfide and Lone Star deposits could also indirectly impact the endangered Gila topminnow in the artesian well in Watson Wash under the same circumstances. The likelihood and magnitude of potential impacts could only be determined after PDSI developed mine plans for these operations. All potential impacts would have to be mitigated before PDSI could obtain the federal permits required for the project.

- **Offered Lands.** Four listed animal species are considered likely to occur on one or several of the offered lands: American peregrine falcon (Tavasci Marsh, Musnicki, Schock, Feulner, Freeland, Clyne I, Clyne II); bald eagle (Tavasci Marsh, Curtis, Amado); lesser long-nosed bat (Musnicki, Feulner, Clyne II); and southwestern willow flycatcher (Tavasci Marsh). A candidate species, Gila chub, is known to inhabit Bonita Creek, which flows through the Amado and Curtis properties. These species, and any other federally listed, proposed, or candidate animal species potentially occurring on the offered lands would be affected by the Land Exchange alternative by coming under BLM management (except species on the Tavasci Marsh property, which would come under NPS management). Any action potentially impacting listed animal species would be subject to Section 7 consultation between the managing agency and the USFWS.

- **No Land Exchange Alternative.** This alternative would result in no immediate direct or indirect impacts to federally listed, proposed, or candidate animal species. Such species on the selected lands would remain under BLM management. Over the longer term, it is reasonable to assume that mining activities would proceed on portions of the selected lands. Impacts of that mining on listed species are likely to be the same as those described under the Proposed Action alternative. Offered lands would remain under private ownership, and any listed animal species on those properties would be protected by provisions of the ESA that pertain to non-federal lands.

4.4.3.3.3 Critical Habitat.

- **Land Exchange Alternative.**
  - **Selected Lands.** No designated critical habitat would be affected by the proposed land exchange itself. Potential effects of the more immediate foreseeable uses, the Dos Pobres/San Juan Project, are identical to those described under the Proposed Action alternative. Potential effects of the more distant foreseeable uses (development of the Dos Pobres sulfide and Lone Star deposits) cannot be quantified at this time; however, groundwater pumping and stormwater diversion would continue and any potential impacts of those activities on designated critical habitat for the razorback sucker in the Gila River would have to be mitigated before the federal permits required for the project could be issued.
  - **Offered Lands.** This alternative would not result in federal protection of additional areas of designated critical habitat through acquisition of the offered lands.
- **No Land Exchange Alternative.** No designated critical habitat would be acquired or impacted by this alternative. Impacts of future BLM-authorized mining on the selected lands would likely be the same as those described under the Proposed Action alternative. No impacts are expected to designated critical habitat for the razorback sucker and the southwestern willow flycatcher in and along the Verde River adjacent to the offered Tavasci Marsh property.

4.4.3.3.4 BLM Sensitive Species.

- **Land Exchange Alternative.** One BLM sensitive plant species (Pima Indian-mallow) and four sensitive animal species (California leaf-nosed bat, Townsend's big-eared bat, cave myotis, and Gila monster) are known or likely to occur regularly in the project area; eleven other BLM sensitive species (northern goshawk, common black-hawk, ferruginous hawk, yellow-billed cuckoo, burrowing owl, small-footed myotis, long-legged myotis, fringed myotis, Yuma myotis, Allen's big-eared bat, and western mastiff bat) may occasionally occur.
  - **Selected Lands.** If this alternative is implemented, BLM sensitive species on the selected lands would inhabit private property and no longer be subject to the effects of BLM land management actions. Wildlife would remain under the jurisdiction of the AGFD. The known population of Pima Indian-mallow is not expected to be impacted by foreseeable uses of the selected lands because it lies outside the footprints for these projects. Though Pima Indian-mallow plants may be present in other parts of the project area, most of the habitat potentially impacted by mining activities does not appear suitable for this species.

    Foreseeable uses of the selected lands are not expected to adversely impact any special status bat species. Nine know mine features lie within the foreseeable use footprints of the Dos Pobres Sulfide and Lone Star projects. Of the four features potentially impacted by the Dos Pobres sulfide project, three are considered unsuitable for bats (Features 15, 16, and 22), and one contained only a single bat, which was observed once in four visits over three years (a Townsend's big-eared bat) (SWCA 1997a). Of the five features potentially impacted by the Lone Star project, two features (7 and 8) are considered unsuitable for bats. Three features (9, 10, and 11) are each considered potentially suitable, but no bats or bat signs were recorded at any of them during three visits over five years (ibid.).

All foreseeable uses of the selected lands are expected to affect the Gila monster in the same manner as described under the Proposed Action alternative.

- **Offered Lands.** The BLM sensitive species on the offered properties would be affected by implementation of this alternative only to the extent that they would be impacted by BLM land management actions. Wildlife would remain under the jurisdiction of the AGFD.

- **No Land Exchange Alternative.** Initially, BLM sensitive species on the selected lands would not be affected under this alternative. Over the long term, however, mining is likely to proceed on portions of the selected lands, and the resulting impacts are expected to be the same as those described under the Proposed Action alternative. BLM sensitive species on the offered lands would not be affected under this alternative.

4.4.3.4 Biodiversity

4.4.3.4.1 Land Exchange Alternative

- **Selected Lands.** Change in land ownership status of the selected lands would not affect biodiversity. The foreseeable uses would impact biodiversity on only a localized scale, affecting , confined to It is not anticipated that biodiversity of the region would be adversely affected by any of the foreseeable uses of the selected lands.

- **Offered Lands.** Federal acquisition and management of the offered lands would neither change nor increase the biodiversity of these properties nor of the regions containing the properties. Consolidation of public land through the exchange is expected to improve the agency's ability to manage the federal lands in the region, which could result in maintaining the current biodiversity of the areas under the current applicable resource management plans.

4.4.3.4.2 No Land Exchange Alternative. In the short term, this alternative would maintain the *status quo* of the subject properties and would have no direct or indirect impacts on biodiversity of either the project area or of the offered lands or the regions that include them. Over the long term, however, it is reasonable to assume that mining activities would proceed on portions of the selected lands; therefore, impacts are expected to be the same as those described under the Proposed Action alternative.

4.4.4 Cultural Resources

4.4.4.1 Historic and Prehistoric Archaeological Resources

4.4.4.1.1 Land Exchange Alternative.

- **Selected Lands.** Disposal of the selected lands (currently the BLM-administered lands in the project area) would remove direct federal protection for all 64 archaeological sites located completely or partially on the selected lands. The selected lands would become the private property of PD. As such, they would no longer be subject to provisions of the National Historic Preservation Act, as amended (NHPA) and other federal statutes protecting archaeological resources, unless an action on that property were to require federal authorization of some kind (e.g., issuance of a permit under the Clean Water Act by the EPA or the COE). Also, the Native American Graves Protection and Repatriation Act (NAGPRA) would no longer protect Indian burial sites on the selected lands because it does not apply to private property under any circumstances. Human remains and burial goods that might incidentally be associated with archaeological sites would be subject to Arizona

Revised Statute 41-865, which requires private landowners to follow specific notification and treatment procedures when human remains have been encountered on their property.

All 64 archaeological sites in the project area affected by the change in legal jurisdiction resulting from this alternative are listed in Table D-1 in Appendix D. Of these sites, 30 are prehistoric, 21 are historic, 6 are multicomponent, and 7 are of unknown temporal association. Fifty-four of the 64 are considered to be potentially eligible for inclusion in the National Register for their scientific values, and 10 are considered to be ineligible. Before the 64 sites could be removed from public ownership and protection by the proposed land exchange, the scientific information contained in the 54 eligible sites would have to be retrieved through a test and data recovery program approved by the BLM. This program would be considered mitigation for all potential impacts on archaeological sites, including potential subsurface deposits and human burials, of foreseeable mining uses of the selected lands.

The Land Exchange alternative, *per se*, would have no physical impact on the archaeological resources on selected lands. However, the foreseeable mining uses of the selected lands would result in physical impacts to a total of 22 archaeological sites (see Table 4-33). The Dos Pobres/San Juan Project would affect 12 sites, of which 11 are considered eligible for the National Register for their scientific values. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect 10 sites: seven within Production Operations and Support areas and three within the Transitional areas. No sites are expected to be impacted in Intermittent Use areas because sites could be avoided by the types of activities anticipated for this category. Of the eight sites in these foreseeable use areas considered potentially eligible for the National Register for their scientific values, three are prehistoric, four are historic, and one is of unknown temporal association. The remaining two sites within these foreseeable use areas are considered ineligible. It should be noted that under this alternative, mitigation (testing and data recovery) for impacts to archaeological resources resulting from the land exchange, i.e., loss of federal protection, would occur prior to any physical disturbance by foreseeable mining uses of the selected lands.

Table 4-33. Archaeological Sites on Selected Lands That Would be Directly Impacted by Foreseeable Uses

	Dos Pobres/San Juan Project	**Dos Pobres Sulfide and Lone Star Projects**
Sites Considered to be Potentially Eligible for the National Register for their Scientific Values	AZ CC:2:148 AZ CC:2:149 AZ CC:2:151 AZ CC:2:152 AZ CC:2:191 AZ CC:2:192 AZ CC:2:193 AZ CC:2:197 AZ CC:2:204 AZ CC:2:213 AZ CC:2:215	AZ CC:2:146 AZ CC:2:147 AZ CC:2:187 AZ CC:2:188 AZ CC:2:189 AZ CC:2:190 AZ CC:2:194 AZ CC:2:226
Sites Considered to be Ineligible for the National Register	AZ CC:2:206	AZ CC:2:183 AZ CC:2:184

- **Offered Lands.** Under the Land Exchange alternative, the three recorded archaeological sites and several other suspected archaeological site on the offered lands would come under the management of the BLM and be protected by federal legislation such as NHPA and NAGPRA.

4.4.4.1.2 No Land Exchange Alternative. In the short term, this alternative would have no effect on historic and prehistoric archaeological resources on either the selected lands or the offered lands. No property would be exchanged; therefore, archaeological sites on public lands in the project area would continue to be managed by the BLM and be subject to NHPA, NAGPRA, and other relevant federal legislation. Over the long-term, however, it is reasonable to assume that mining activities would proceed on portions of the selected lands. In that case, impacts to archaeological sites are expected to be the same as those described under the Proposed Action alternative.

Under the No Land Exchange alternative, archaeological resources on the offered properties would remain in private ownership with no direct protection from federal statutes. Human remains and burial goods that might incidentally be associated with archaeological sites would continue to be subject to Arizona Revised Statute 41-865, which requires (with certain exemptions) private landowners to follow specific notification and treatment procedures when human remains of any kind have been encountered on their property.

4.4.4.2 Traditional Cultural Properties Identified by Indian Tribes

4.4.4.2.1 Land Exchange Alternative.

- **Selected Lands.** The land exchange would affect all 41 sites on the selected lands identified by tribes as being traditional cultural properties (Table 4-34). Transferring ownership of the selected lands to PD would remove these sites from the direct federal oversight responsibilities required under NHPA. The transfer of ownership would also eliminate the federal consideration extended by the American Indian Religious Freedom Act (AIRFA) to two of the sites, AZ CC:2:200 and 211, that have been identified by tribes as being sacred. Under AIRFA, allowing access to sacred sites, if so desired by Native Americans, should be a prime consideration of federal land management agencies. Additionally, Executive Order 13007--Indian Sacred Sites, May 24, 1996, states that federal agencies such as BLM must "to the extent practicable and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites." Under the Land Exchange alternative, access to sites on the selected lands that have been identified by tribes as being traditional cultural properties and/or sacred would be under the control of PDSI.

Table 4-34. Traditional Cultural Properties that Would be Affected by the Loss of Federal Oversight under the Land Exchange Alternative

AZ CC:2:132	AZ CC:2:152	AZ CC:2:193	AZ CC:2:201	AZ CC:2:214	AZ CC:2:221	AZ CC:2:228
AZ CC:2:146	AZ CC:2:153	AZ CC:2:194	AZ CC:2:205	AZ CC:2:215	AZ CC:2:222	AZ CC:2:229
AZ CC:2:147	AZ CC:2:186	AZ CC:2:195	AZ CC:2:210	AZ CC:2:217	AZ CC:2:223	AZ CC:2:231
AZ CC:2:148	AZ CC:2:188	AZ CC:2:196	AZ CC:2:211	AZ CC:2:218	AZ CC:2:225	AZ CC:2:233
AZ CC:2:149	AZ CC:2:191	AZ CC:2:199	AZ CC:2:212	AZ CC:2:219	AZ CC:2:226	AZ CC:2:234
AZ CC:2:151	AZ CC:2:192	AZ CC:2:200	AZ CC:2:213	AZ CC:2:220	AZ CC:2:227	

Under this alternative, 14 of the 41 archaeological sites on the selected lands identified by tribes as traditional cultural properties would be physically impacted by foreseeable mining uses (Table 4-35). Two additional sites, AZ CC:2:200 and 211, had the potential to be impacted, but PDSI has agreed to avoid them because the sites have been identified as sacred places as well as traditional cultural properties. PDSI has agreed to allow Native Americans access to the two sites if sufficient notice is given.

Table 4-35. Sites Identified by Indian Tribes as Being Traditional Cultural Properties that Would be Directly Impacted by the Foreseeable Uses of the Selected Lands

Dos Pobres/San Juan Project			Dos Pobres Sulfide/Lone Star Projects	
AZ CC:2:148	AZ CC:2:152	AZ CC:2:193	AZ CC:2:146	AZ CC:2:194
AZ CC:2:149	AZ CC:2:191	AZ CC:2:213	AZ CC:2:147	AZ CC:2:226
AZ CC:2:151	AZ CC:2:192	AZ CC:2:215	AZ CC:2:188	

The Dos Pobres/San Juan Project would destroy or damage nine sites on selected lands identified by tribes as traditional cultural properties. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies (Production Operations and Support) would likely destroy or damage five such sites. Although sites considered by tribes to be traditional cultural properties are located in the Intermittent Use areas, they would not be impacted because the types of activities anticipated for this category can avoid sites.

- **Offered Lands.** Under the Land Exchange alternative, the known and unknown archaeological resources on the offered lands would come under the protection of federal legislation such as NHPA and NAGPRA. Although none of the 11 tribes consulted identified specific traditional cultural properties on any of the offered lands, the Hopi and Zuñi consider all prehistoric archaeological sites within these lands to be traditional cultural properties (SWCA 1997k). Any traditional cultural properties occurring on the offered properties would benefit from protection under federal land ownership.

4.4.4.2.2 No Land Exchange Alternative. In the short term, sites on the selected lands identified by tribes as traditional cultural properties would not be physically affected by mining. They would remain under BLM management and be subject to consideration under NHPA, AIRFA, and Executive Order 13007, particularly regarding access to sacred sites by Native Americans who wish to visit the sites. Over the long-term, however, it is reasonable to assume that mining activities would proceed on portions of the selected lands. In that case, impacts to sites on the selected lands identified by tribes as traditional cultural properties are expected to be the same as those described under the Proposed Action alternative.

Traditional cultural properties on the offered properties, if any occur, would also be unaffected by this alternative. They would remain in private ownership, outside of federal oversight responsibilities. Treatment of these sites and access to them would be at the discretion of the landowner.

4.4.5 Socioeconomic Resources

4.4.5.1 Population and Demographics

4.4.5.1.1 Land Exchange Alternative.

- **Selected Lands.** No impacts to the local Safford population is expected as a result of the exchange. The impacts of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect population size and demographics in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.

- **Offered Lands.** The Land Exchange alternative would not affect local or regional population size or demographics in or near the offered lands.

4.4.5.1.2 No Action Alternative. The No Action alternative would not affect the current population size and demographics in Graham County or in or near the offered lands. Population would continue to grow in the Safford area as a result of factors other than mining (e.g., increased tourist-based business, influx of retirees, etc.).

4.4.5.2 Local and Regional Economy

4.4.5.2.1 Employment.

- **Land Exchange Alternative.**

  - **Selected Lands.** No impacts to local or regional economy are expected as a result of the exchange. The impacts on employment and income of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect employment and income in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.

  - **Offered Lands.** The Land Exchange alternative would not affect local or regional employment or income in or near the offered lands.

- **No Action Alternative.** The No Action alternative would not, in and of itself, affect the local or regional economy in Graham County or in or near the offered lands. However, it is reasonable to expect that mining would take place in the Safford area as BLM must subsequently respond to the mine plan proposal (Proposed Action), therefore, impacts identical to those of the Proposed Action would be expected to occur.

4.4.5.2.2 Income.

- **Land Exchange Alternative.**
  - **Selected Lands.** The exchange would not affect the per capita income of the residents of Graham County. The impacts on employment and income of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect employment and income in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.
  - **Offered Lands.** The Land Exchange alternative would not affect local or regional employment or income in or near the offered lands.
- **No Action Alternative.** The No Action alternative would not affect the local or regional economy in Graham County or in or near the offered lands. No mining would take place in the Safford area so no changes would be expected there in employment, income, or taxes.

4.4.5.2.3 Taxes.

- **Land Exchange Alternative.**
  - **Selected Lands.** The exchange would result in a long-term increase in private property tax revenues for Graham County, as the selected lands would be taxed as private lands with mining/industrial uses. The impacts on employment and income of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect employment and income in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.

    Under the Land Exchange alternative, the impacts on local taxes of the foreseeable mining uses of the selected lands as described in the MPO would be identical to those presented in Section 4.6.1 under the Proposed Action alternative, with the following exceptions: 1) Graham County would lose the payments in lieu of taxes (PILT) now paid by BLM for the selected lands. On the basis of $1.16 per acre, this loss would total $19,634 (ESI 1997). 2) Graham County would gain an undeterminable amount in annual property taxes after PDSI acquired the selected lands. The amount cannot be estimated because PD's real properties in Graham County are determined annually "in bulk," that is, a single figure is derived that represents the value of both improved and unimproved property (ESI 1997). The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect tax revenue in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.
  - **Offered Lands.** The Land Exchange alternative would not affect local or regional employment or income in or near the offered lands.

Under this alternative, each offered property would be removed from the tax roles of the county in which it is located, and PILT payments by the federal government would increase in that county (ESI 1997). Table 4-36 shows the expected tax loss and PILT gain by county and offered property. The Land Exchange alternative would result in a total net loss of $5,595.00 in revenue each year.

Table 4-36. Annual Tax Revenues Lost and PILT Payments Gained Under the Land Exchange Alternative by County and Offered Property

County / Offered Property	Tax Loss Per Property	Tax Loss	PILT Gain Per Property	PILT Gain	NET Gain or (Loss)
Graham County		$113.00		$1,085.00	$972.00
Amado Property	$22.00		$209.00		
Curtis Property	$91.00		$876.00		
Pima County		$2,496.00		$835.00	($1,661.00)
Feulner Property	$74.00		$371.00		
Clyne II Property	$2,422.00		$464.00		
Santa Cruz County		$1,101.00		$278.00	($823.00)
Schock Property	$1,101.00		$278.00		
Cochise County		$1,080.00		$1,261.00	$181.00
Musnicki Property	$155.00		$742.00		
Freeland Property	$292.00		$162.00		
Butler-Borg Property	$633.00		$357.00		
Yavapai County		$4,640.00		$376.00	($4,264.00)
Tavasci Marsh Property	$4,640.00		$376.00		
TOTAL		**$9,430.00**		**$3,835.00**	**($5,595.00)**

Source: ESI 1997

- **No Action Alternative.** The No Action alternative would not affect the local or regional economy in Graham County or in or near the offered lands. No mining would take place in the Safford area so no changes would be expected there in employment, income, or taxes.

4.4.5.3 Infrastructure

4.4.5.3.1 Housing.

- **Land Exchange Alternative.**

  - **Selected Lands.** No impacts to local housing supply or demand are expected from the exchange. The impacts on local housing supply and demand of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies could potentially affect housing supply and demand in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the magnitude or significance of those effects.

- **Offered Lands.** The Land Exchange alternative would not affect housing supply or demand in or near the offered lands.

- **No Action Alternative.** Under this alternative, no changes would result to housing supply or demand in either the Safford area or in or near the offered lands.

4.4.5.3.2 Utilities (Water, Electric/Gas, Sewer, Telephone, Garbage).

- **Land Exchange Alternative.**

  - **Selected Lands.** The impacts on local utilities services from the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies would affect utilities in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the magnitude or significance of those effects.

  - **Offered Lands.** The Land Exchange alternative would not affect local utilities service in or near the offered lands.

- **No Action Alternative.** Under this alternative, no changes would result to local utilities service in either the Safford area or in or near the offered lands.

4.4.5.3.3 Schools.

- **Land Exchange Alternative.**

  - **Selected Lands.** The impacts on local schools of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies could affect schools in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the magnitude or significance of those effects.

  - **Offered Lands.** The Land Exchange alternative would not affect schools near the offered lands.

- **No Action Alternative.** Under this alternative, no changes would result to schools in either the Safford area or near the offered lands.

4.4.5.3.4 Emergency Response.

- **Land Exchange Alternative.**

  - **Selected Lands.** The impacts on local emergency response services of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies could affect such services in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.

- **Offered Lands.** The Land Exchange alternative would not affect local emergency response services in or near the offered lands.

- **No Action Alternative.** Under this alternative, no changes would result to local emergency response services in either the Safford area or near the offered lands.

4.4.5.4 Transportation

4.4.5.4.1 Land Exchange Alternative.

- **Selected Lands.** The impacts on local transportation of the foreseeable mining uses of the selected lands as described in the MPO are presented in Section 4.6.1 under the Proposed Action alternative. The more distant foreseeable uses related to development of the Dos Pobres sulfide and Lone Star orebodies could affect transportation in the Safford area, but no information is yet available about the scale of the mining operations, so predictions cannot be made regarding the significance of those effects.

- **Offered Lands.** The Land Exchange alternative would not affect transportation in the vicinity of the offered lands except as it relates to issues of access (see Section 4.2.3.2.2 Offered Lands).

4.4.5.4.2 No Action Alternative. Under this alternative, no changes would result to transportation in either the Safford area or in or near the offered lands.

4.4.6 Indian Trust Resources

4.4.6.1 Land Exchange Alternative

4.4.6.1.1 Selected Lands. The disposal of public lands to Phelps Dodge would not directly or indirectly impact Indian trust assets. Under this alternative, BLM is neither acquiring nor disposing of resources identified as Indian trust lands, tribal water rights, hunting or fishing rights, or other resources considered to be Indian trust resources (assets).

Foreseeable mining uses of the selected lands, however, are predicted to result in reduced surface flows in the Gila River and its tributaries totaling a maximum of 75.4 af/yr as discussed in Section 4.3.1.6.1 and 4.3.2.6.1. This impact to Gila River flows, if unmitigated, would impact downstream Indian trust water rights belonging to both the San Carlos Apache Tribe and the Gila River Indian Community. However, since impacts to Gila River flows would be fully mitigated in perpetuity as described in Appendix F, no unmitigated impacts to Indian water rights (i.e., trust resources) are expected. Federal permits that would authorize future potential implementation of mining at the Dos Pobres sulfide and the Lone Star projects would also require mitigation for any potential additional or continued impacts to flows of the Gila River and its tributaries resulting from activities associated with those projects; therefore, no unmitigated impacts to Indian water rights are anticipated with those foreseeable uses of the selected lands.

4.4.6.1.2 Offered Lands. No Indian trust resources would be impacted as a result of public acquisition of the offered lands.

4.4.6.2 No Land Exchange Alternative. The No Land Exchange alternative would not, in and of itself, impact any Indian trust resources on either the selected or offered lands. However, as BLM must subsequently select a mine plan alternative if it chooses this alternative, impacts to Indian trust resources would be identical to those described for the Proposed Action alternative.

4.5 CUMULATIVE EFFECTS

4.5.1 Approach

Cumulative effects analysis was undertaken pursuant to the requirements of NEPA and BLM regulations and policy. The objective of this analysis is to place the consequences of the Project into the context of other past actions, present actions, or reasonably foreseeable future federal and non-federal actions (RFFAs) to ensure that decisions stemming from this EIS consider the full range of potential Project consequences (CEQ 1997).

Five steps were taken to analyze cumulative effects associated with the Dos Pobres/San Juan Project. Each step is listed and briefly discussed below:

- Identify cumulative effects issues,
- Identify the temporal and spatial extent of the study area,
- Identify Past, Present, and Reasonably Foreseeable Future Actions (RFFAs) relevant to each issue,
- Establish the baseline/trend for the resources considered, and
- Analyze cumulative effects

While "all of the impacts on affected resources are probably cumulative," the purpose of the first step is to limit cumulative effects analysis to "important issues of national, regional, or local significance" (CEQ 1997). Therefore, not all issues identified for direct and indirect impact assessment (refer to Table 1-4 in Chapter 1) have been analyzed for cumulative effects. The selection of issues for cumulative impacts consideration is based upon the scoping issues raised and the experience and expertise of the Interdisciplinary (ID) Team.

After considering the nature of direct and indirect effects, the resources and/or components of the environment identified by the ID Team for cumulative impact assessment include:

1. Land Use
   - Land Tenure
   - Visual Resources
2. Physical Resources
   - Air Quality
   - Ground Water Resources
   - Surface Water Resources
   - Waters of the United States
3. Biological Resources:
   - Vegetation and Wildlife
   - Threatened & Endangered Species, and
4. Socioeconomic Resources

These are resources that, after consideration of the Proposed Action, past actions, present actions, and RFFAs, are most likely to experience some level of cumulative impact within the spatial and temporal boundaries of this analysis.

Steps two and three are, by their nature, interrelated; past, present, and reasonably foreseeable future actions largely define the temporal and spatial extent of the study area. The completion of steps two, three, and four provides the framework or context for consideration of cumulative effects discussed in the next section.

4.5.2 Context

The framework in which the cumulative effects were considered is provided below. Past and present actions are commonly a major influence over the baseline/trend data for a resource, and RFFAs can likewise be expected to influence future resource trends. Therefore information on past and present actions, RFFAs, and baselines/trends is presented together to provide the context for cumulative effects analysis provided in Section 4.5.3.

4.5.2.1 Temporal and Spatial Extent of the Study Area

Temporal and spatial boundaries for cumulative effect analysis vary by resource/issue. Rather than define multiple, arbitrary boundaries for each resource/issue, the ID Team reviewed each of the issues identified for cumulative effects analysis and identified the past actions, present actions, and RFFAs appropriate for a particular resource's cumulative impact analysis. These actions were then compiled and categorized by location zone (distance from the proposed project area). This list of actions, presented in Table 4-37 and graphically depicted in Figure 4-20, defines the temporal and spatial boundaries of this analysis.

Temporally, projects are divided into three broad categories: past actions, present actions, and RFFAs. This compilation of projects reflects the collective experience and knowledge of the ID Team. These projects are considered because of their relevance to one or more of the issues identified for cumulative impacts analysis. The projects listed include those that have only recently been completed or are ongoing (such as the telescope construction projects on Mount Graham) as well as projects that have been components of the regional landscape for many decades, such as the mining activities at Morenci and agricultural uses of surface water and groundwater in the Safford Valley.

Projects identified as RFFAs are those projects that: 1) the ID Team is aware of and would classify as reasonably foreseeable, i.e., not overly speculative; and 2) have the potential to contribute to cumulative effects. Projects considered here include the Dos Pobres sulfide, Lone Star, and Sanchez projects in the Safford Mining District. These projects are reasonably likely (although not certain) to occur during or after completion of the mining activities of the proposed Project. A brief discussion of the more notable mine and land exchange projects that are considered in this analysis is provided below.

4.5.2.2 Mining - Past and Present Actions and RFFAs

Past mining activities have been prolific in the southeastern part of the state, with most of the mining and prospecting activities focused upon copper, gold, silver, lead, zinc, and/or tungsten. Very few of these old workings have been adequately reclaimed because regulations that required reclamation of mining activities on public lands were not enacted until 1981, and it was only in 1995 that the State of Arizona enacted mine reclamation laws for non-federal lands. Past copper mining activities have been mostly underground operations and were done before the commercial development of the SX/EW process. There are a number of old unreclaimed workings and tailings piles; the most notable ones nearest the Safford Mining District are located in the Aravaipa Mining District, some 45 miles west of Safford.

The only significant current mining operation anywhere near the Gila Mountains is the PD Morenci Mine complex, located about 30 miles northeast of Safford. This is one of the largest open-pit copper mine operations in the world, producing both oxide copper amenable to SX/EW, and sulfide copper that is concentrated by conventional milling and shipped by railroad to a smelter in New Mexico.

Table 4-37. Other Activities (Existing and Proposed) that may Cumulatively Affect Resources

Activity	Location Zone[1]	Status[2]	Anticipated Environmental Effect Which Could Be Cumulative[3]
1. Dos Pobres Sulfide Project	A	f	a, sw, gw, v, v&w, **se**
2. Lone Star Project	A	f	a, sw, gw, v, v&w, **se**
3. Sanchez Copper Project	A	f	a, sw, gw, v, v&w, **se**
4. Morenci Mine	B	p, e, f	a, sw, gw, v, v&w, t&e, **se**
5. Agricultural Practices — Safford Valley	A	p, e, f	sw, gw, t&e, **se**
6. Agricultural Development — San Carlos Apache Reservation	B	e, f	sw, t&e, se
7. Gila Box Riparian National Conservation Area	A, B	e, f	**sw, v&w, t&e**
8. BLM Grazing ESA Consultation with USFWS	A, B, C	f	**sw, v&w, t&e**
9. BLM Grazing Leases	A, B, C	p, e, f	sw, v&w, t&e
10. Mt. Graham Telescope Development	B	e, f	v&w, t&e
11. CMMC Leach Expansion Project	C	f	a, sw, gw, v, v&w, se
12. ASARCO Ray Land Exchange	C	f	sw, gw, v&w, t&e, se, v
13. Safford Conventional WWTP and Reuse Project	A	f	**sw,gw**
14. City of Safford Water Development — Bonita Creek	A	e, f	sw, gw, v&w, t&e
15. Thatcher — Wetland WWTP and Reuse Project	A	f	**v&w, sw**
16. San Simon Valley Restoration Project	B, C	p	**v&w, sw, gw, t&e**
17. AGFD Ash Creek Water Development Project	B	f	**v&w, sw**
18. Gila Monster (Non-point source working group)	C	f	**sw, gw, t&e**
19. Forestry — National Forest Lands	C	p, e, f	sw, v, v&w, t&e, se
20. Abandoned Mines	B	p	sw, gw
21. Gila River Indian Community — Agricultural Development	C	p, e, f	sw, gw, v&w, t&e
22. Chino Mine Expansion	C	f	a, sw, gw, v&w
23. Continental Mine Expansion	C	f	a, sw, gw, v&w, **se**
24. Copper Flat Project	C	f	a, sw, gw, v&w, **se**
25. Little Rock Mine	C	f	a, sw, gw, v&w, **se**
26. Morenci Land Exchange	C	f	**v&w, t&e, se**
27. San Manuel Mine and Proposed Expansion	C	e,f	a, sw, gw, v&w, t&e, **se**
28. BHP Pinto Valley Operations	C	p,e,f	a, sw, gw, v&w, t&e, **se**
29. Carlota Copper Co.	C	f	a, sw, gw, v&w, t&e, **se**
30a. Rosemont MPO	C	f	a,sw, gw, v&w, **se**
30b. Rosemont Land Exchange	C	f	**v&w, t&e, se**
31. Arizona Desert Wilderness Act	C	p	**v&w, t&e, a, sw, gw**
32. Wild & Scenic Rivers Proposed Designations	A,B,C	e, f	**v&w, t&e, sw, gw**
33. The Nature Conservancy Activities -- San Pedro River, Ramsey Canyon, and Mule shoe Ranch	B,C	p,e,f	**v&w, t&e, sw, gw, se**
34. Base Realignment and Closure (BRAC) Ft. Huachuca	C	e,f	a, v&w, t&e, sw, gw, **se**
35. Existing Environmental Regulations (CWA, CAA, APP, ESA, NHPA, etc.)	A,B,C	p,e,f	**a, v&w, t&e, sw, gw**
36. BLM/Arizona State Land Exchanges (Mule Shoe Ranch, San Pedro River, Cienega Creek)	B,C	p	**v&w, t&e, sw, gw, v,se**
37. BLM Hualapai Mtn. Exchange	C	f	**v&w, t&e, sw, gw, v,se**
38. Mission Mine Expansion	C	f	a, sw, gw, v&w, t&e, **se**
39. Gila River Indian Community Farm Expansion	C	p,e,f	a, sw, gw, v&w, t&e, **se**

1. A = 0-25 km, B = 26-100 km, C = >100 km
2. f =future activity, e=existing activity, p=past activity
3. a=air, sw=surface water, gw=ground water, v=visual, v&w=vegetation & wildlife, t&e = listed species, se=socioeconomic (bold denotes a positive impact)

4.5.2.3 Land Use/Tenure - Past and Present Actions and RFFAs

From the end of fiscal year 1964 through fiscal year 1993, the acreage of federal land managed nationwide by the four federal land management agencies (BLM, U.S. Forest Service [USFS], United States Fish and Wildlife Service [USFWS], and National Park Service [NPS]), decreased by 11 percent, or approximately 77 million acres (General Accounting Office [GAO] 1995). However, the amount of land managed by these four agencies increased in 46 states and in the District of Columbia by almost 21 million acres. The largest decrease in acreage occurred in Alaska, where a total of nearly 96 million acres of land managed by the BLM was transferred to the State of Alaska (76 million acres) and to Native Alaskans (36 million acres) (ibid.). During this same period, an additional 16 million acres of land in Alaska were added to the inventory of lands managed by the USFS, USFWS and NPS.

The General Accounting Office (1995) reports that of the roughly 72,688,000 acres of land in Arizona, 29,867,616 (41 percent) are managed by one of four federal land management agencies. Table 4-38 summarizes the change in acreage of lands managed by these federal land management agencies in Arizona from 1964 to 1993.

Table 4-38. Change in the Acreage Managed by Four Federal Land Management Agencies in Arizona

	Acres Managed		
Federal Land Management Agency	***1964***	***1993***	**Net Acreage - Gain (Loss)**
BLM	13,034,217	14,255,889	1,221,672
NPS	2,474,249	2,692,176	217,927
USFS	11,410,808	11,247,052	(163,756)
USFWS	6,977	1,672,499	1,665,522
TOTAL	**26,926,251**	**29,867,616**	**2,941,365**

Source: GAO 1995

Cumulatively, the lands subject to the multiple resource management objectives of the BLM or USFS and the management goals of the NPS and USFWS have increased by almost 2.9 million acres during this 30-year period. Arizona BLM experienced a net gain of approximately 1,221,672 acres of public lands (GAO 1995). Within the Safford Field Office, major land tenure adjustments in the past have included acquisitions of aquatic and upland resources within the Cienega Creek and San Pedro River corridors, and acquisition of lands surrounding the Muleshoe Ranch. Significant land exchange proposals currently being considered by the USFS include the Tusayan Land Exchange near the Grand Canyon and several exchanges in or near Payson, Arizona. Table 4-39 summarizes some of the more notable land exchanges considered for this analysis.

4.5.2.4 Resource Baselines/Trends

Where possible, baseline conditions or trends were established from existing sources of information. This information was then supplemented by input from the ID Team based upon their experience and expertise. These data are presented in both quantitative and qualitative formats. It should be noted that, in analyzing cumulative effects of an alternative, if that alternative has no direct or indirect impacts, it cannot contribute cumulatively to impacts on a given resource.

Table 4-39. Potential Net Change in Public Lands Tenure as a Result of Land Exchanges Currently under Consideration by the USFS and BLM in Arizona

Exchange	Acreage of Selected Lands (Federal Lands transferred to Private Ownership)	Acreage of Offered Lands (Private Lands transferred to Public Ownership)	Net Acreage Gain (Loss)
Safford Exchange Alternative	17,000	3,858	(13,142)
[1]Morenci Exchange	3,758	1,040	(2,718)
[2]ASARCO/BLM Exchange	10,976	8,994	(1,982)
[3]Tusayan Exchange	672	2,184	1,512
TOTAL	**32,406**	**16,076**	**(16,330)**

[1] Morenci Land Exchange FEIS

[2] Noelle Sanders, SWCA, personal communication.

[3] First Exchange alternative in the Draft Environmental Impact Statement for Tusayan Growth

A trend analysis of surface water quality in the upper Gila River was completed by the USGS in 1995 (Baldys 1995). The study was based upon data collected between 1972 and 1987. Two of the sites were located on the Gila River (Calva, Arizona and Redrock, New Mexico) and one was located on the San Francisco River near Clifton, Arizona. Table 4-40 summarizes the data presented in that study and in ADEQ's 1996 Arizona Water Quality Assessment (ADEQ 1996), which also used these data. Findings and conclusions at these three sites, by site, included (after ADEQ 1996):

- Total phosphorus, dissolved lead, total manganese, and dissolved zinc declined, while ammonia plus organic nitrogen increased at the Clifton, Arizona site;
- Dissolved solids, sodium, sulfate, and chloride were decreasing, while total lead was increasing at the Redrock, New Mexico site; and
- Hardness, dissolved solids, sodium, sulfate, chloride, total phosphate, dissolved lead, total manganese, and dissolved zinc were decreasing, while pH was increasing at the Calva site downstream of the town of Safford.

These data provide general indications of the cumulative effects of historic activities on water quality in the Gila River upstream from and in the vicinity of the proposed Project. The general activities reflected by the results of the measured water quality parameters include, but are not limited to, irrigation practices including return flows, historic and extant mining activities, and urban runoff from developed portions of the watershed.

In their 1996 CWA 305b Report, ADEQ (1996) also reported that:

- Past monitoring efforts at the Morenci Mine had detected contaminated water in Gold Gulch, a tributary to the San Francisco River. This water is now being captured on-site and pumped back to the mine for use as process water (ADEQ 1996).
- PD has applied for an Aquifer Protection Permit for its Morenci facility. In the process of "developing this permit all surface and groundwater concerns should be addressed for this site" (ADEQ 1996).

The discharge rate of the Gila River as it flows through the Safford Valley is roughly 477cfs (345,000 af/yr). The lowest annual average is 101 cfs (73,171 af/yr) and the highest is 2,229 cfs (1,614,827 af/yr). Consumptive water use for agriculture (combined groundwater pumping and surface water diversion) in the Safford valley is estimated to be 153,000 af/yr (211 cfs). The City of Safford obtains its water for municipal and industrial uses from wells located within the Safford Valley and from a diversion on Bonita Creek. The

Table 4.40 Summary statistics and surface water quality trend analysis. Data compiled from USGS Water-Resources Investigations Report 95-4083 (Baldys, III et. al. 1995). Units for summary statistics indicated next to water quality constituent name. Number in ( ) under mean is sample size. Trend refers to the temporal trend of the water quality constituent at the indicated sample location. N= no trend, I = increasing, and D = decreasing. Trend conclusions based on p=0.1 level of significance. '-' = data not available or not calculated. mg/l = milligrams per liter or parts per million and μ/l = micrograms per liter or parts per billion.

Water Quality Constituent	Location											
	Gila River Near Red Rock, NM [collection period 9/73 to 9/87]				San Francisco River near Clifton, AZ [collection period 1/76 to 9/87]				Gila River at Calva, Arizona [collection period 10/74 to 9/87]			
	Mean (n)	Median	Range	Trend	Mean	Median	Range	Trend	Mean	Median	Range	Trend
pH	- (191)	8.2	6.9 - 9.1	N	- (105)	8.2	6.9 - 9.6	N	- (133)	8.2	6.8 - 9.8	I
Turbidity (NTU)	158 (64)	10	<0.01 - 6,500	N	87.7 (31)	5.5	0.60 - 1,500	N	472 (101)	40	0 - 21,000	N
Hardness (mg/l)	115 (141)	120	46 - 180	N	221 (109)	230	70 - 440	N	521 (142)	420	63 - 1,300	D
Dissolved Solids (mg/l)	221 (89)	229	68 - 349	D	676 (109)	630	178 - 1,830	N	2,060 (142)	1,700	244 - 4,680	D
Dissolved Sodium (mg/l)	28.7 (139)	31.0	7.8 - 44.0	D	142 (83)	130	17 - 420	N	525 (142)	425	2.5 - 1,200	D
Dissolved Sulfate (mg/l)	32.8 (141)	34	<1.0 - 49.0	D	30.6 (109)	30.0	2.0 - 79.0	N	341 (142)	280	30.0 - 810	D
Dissolved Chloride (mg/l)	11.8 (141)	12	2.0 - 44.0	D	257 (83)	230	16 - 870	N	786 (145)	590	31 - 2,200	D
Total Ammonia + Org. N (mg/l)	0.80 (77)	0.47	0.10 - 11.0	N	1.08 (83)	0.40	0.01 - 18.0	I	2.01 (142)	0.80	0.10 - 74.0	N
Total Phosphorus (mg/l)	0.25 (77)	0.09	0.02 - 4.40	N	0.50 (82)	0.10	0.01 - 7.90	D	0.98 (146)	0.19	0.01 - 21.0	D
Dissolved Arsenic (μ/l)	1.74 (45)	2	<1.0 - 4.0	N	2.40 (25)	2.0	1.0 - 4.0	N	4.38 (88)	4.0	<1.0 - 8.0	N
Dissolved Barium (μ/l)	23.5 (41)	20.0	6.0 - 50.0	N	40.0 (24)	34.0	12.0 - 100	N	95.9 (75)	56	15.0 - 600	N
Total Boron (μ/l)	40 (2)	40	40 - 40	-	151 (45)	150	50 - 270	N	674 (64)	705	110 - 1,300	N
Dissolved Chromium (μ/l)	0.41 (36)	0.02	<1.0 - 10.0	N	0.78 (24)	0.67	<1..0 - 2.0	N	1.59 (85)	0.56	<1.0 - 10.0	N
Suspended Copper (μ/l)	40.4 (16)	10.0	<1 - 410	N	27.7 (6)	22.0	3.0 - 63.0	-	137 (31)	20.0	<5 - 1,500	N
Total Copper (μ/l)	37.2 (19)	7.76	3.0 - 420	N	229 (110)	26.5	<1 - 10,000	N	152 (124)	43.0	<1 - 3,200	N
Dissolved Lead (μ/l)	1.39 (41)	1.00	<1.0 - 5.00	N	1.52 (61)	1.00	<1.0 - 12.0	D	3.41 (95)	1.00	<1.0 - 70.0	D
Total Lead (μ/l)	20.1 (23)	5.0	<1.0 - 330	I	11.8 (75)	5.5	<2.0 - 84.0	N	26.6 (121)	8.0	<1.0 - 400	N
Total Manganese (μ/l)	685 (19)	40	8.0 - 11,000	N	321 (69)	110	10.0 - 3,900	D	953 (116)	300	8.0 - 11,000	D
Dissolved Zinc (μ/l)	11.8 (44)	8.0	<3.0 - 1,280	N	32.7 (65)	10.0	<3.0 - 600	D	20.5 (96)	11.5	<3.0 - 210	N
Total Organic Carbon (mg/l)	6.64	3.80	1.90 - 54.0	N	7.21	2.4	0.50 - 87.0	N	19.9	8.00	3.6 - 300	N

City's diversion structure is an infiltration gallery located in the channel-fill of the creek approximately four miles upstream of the confluence of Bonita Creek and the Gila River. Total withdrawals from the Gila Valley basin in 1985 were about 8,000 af (ADWR web site @ http://www.adwr.state.az.us).

Of all the resources being considered for cumulative impacts, conclusions regarding biological resources seem most sensitive to the spatial scale of analysis. On a local basis (the Safford Valley), discussions of cumulative impacts vary significantly from those that consider a larger analysis area.

At the local scale, past, present, and reasonably foreseeable future actions that most affect biological resources are:

- The potential mine-related RFFAs in the Safford Mining District;
- Future increases in water demand, if they are unmitigated; and
- Past and present agricultural activities in the Safford Valley.

Past agricultural development in the Safford Valley totals about 32,500 acres (Graham County Cooperative Extension, pers. comm. 1997) and has resulted in the clearing of extensive areas of riparian (broad-leaf and mesquite bosque) habitats. Continued consumptive water use for irrigated lands of an estimated 138,000 af (190 cfs) of water annually from the Gila River and its alluvial aquifer for agricultural purposes continues to affect the distribution and characteristics of aquatic and riparian resources within and downstream of the Safford Valley. Added to these past and present impacts is the potential for a total of 11,675 acres of additional surface disturbance with full implementation of mine-related RFFAs within the Safford Mining District.

At a regional or state-wide scale of analysis, localized impacts that result or would result from past, present, and RFFAs become less significant. Past, present, and RFFAs that shape the nature of potential cumulative impacts to biological resources at a regional or statewide scale include:

- The net increase in the acreage of federally managed public lands that has taken place since 1964;
- The net decrease of more than 16,300 acres of public lands that would result from implementation of the Land Exchange alternative and other RFFAs listed in Table 4-39, which represents less than one percent of the overall net gain in federal lands in Arizona since 1964;
- The establishment of wilderness areas and other special management actions such as the Gila Box Riparian National Conservation Area;
- Mandated changes in the renewable resources management focus and practice by the BLM and USFS as a result of recent litigation by environmental groups; and
- Private/public initiatives such as the Gila Monster (a non-point source working group actively seeking solutions to non-point source water pollution issues along the Gila River) and The Nature Conservancy's active management role in southeastern Arizona (e.g. the San Pedro River and Muleshoe Ranch).

To a large extent, land acquisitions by federal land management agencies have focused on lands with high biological resource values and/or lands that facilitate the multiple resource management objectives of the managing federal agency. Of particular importance in these acquisitions has been the identification of lands with known populations of threatened and endangered species or lands with the potential to support threatened or endangered species. Specific examples of land acquisitions in southern Arizona by federal agencies to support and manage biological resources include the establishment and expansion of the Buenos

Aires National Wildlife Refuge, land acquisitions along the San Pedro River, the Cienega Creek land exchange, the Muleshoe Ranch exchange, and past and proposed expansions of Saguaro National Park.

As outlined in Chapter 3, dominant habitats in the project area include Sonoran Desertscrub, Semidesert Grassland, and a broad ecotone combining elements of these two biotic communities. In Arizona, Upland Sonoran Desertscrub and Semidesert Grassland biotic communities cover approximately 10,379,00 acres and 6,892,000 acres, respectively.

Upland habitats throughout much of Arizona are crossed by numerous ephemeral drainages, the majority of which support xeroriparian vegetation. Xeroriparian vegetation in the project area is generally open and patchily distributed. As is typical with xeroriparian vegetation, most of the plant species present also occur in upland habitats, although at lower densities and generally in smaller sizes.

Based upon xeroriparian vegetation volume and composition, xeroriparian habitats in the project area are of relatively low value. Within the project area, creosotebush, not normally considered to be a riparian plant, comprised 30.4, 23.0, and 33.9 percent of the vegetation volume in the three categories, respectively, of xeroriparian habitat identified in the project area (SWCA 1997a). The average vegetation volume of all xeroriparian habitats measured in the project area was less than 0.42 m^3/m^2 (ibid.). Compared to many areas of southern Arizona, this volume of xeroriparian vegetation is low. While many of the more characteristic Upland Sonoran Desertscrub habitats in southern Arizona support vegetation volumes greater than 0.5 $m3/m^2$, upland habitats in the project area supported an average vegetation volume of 0.24 m^3/m^2 (ibid.).

Surface management activities of the federal land management agencies have been affected by recent legal activity initiated by the Southwest Center for Biological Diversity. As a result of a Notice of Intent to Sue, BLM entered into Section 7 Consultation with the USFWS regarding potential impacts to threatened and endangered species from ongoing implementation of BLM grazing programs. The BLM is actively implementing terms, conditions, and conservation measures outlined in the final biological opinion issued by the USFWS that resulted from this consultation (M. McQueen, BLM, pers. comm.). Fifteen grazing allotments are affected by the terms, conditions, and conservation measures that have resulted from this consultation. The net result of this consultation was removal of cattle from riparian habitats in the Safford Field Office, which would affect five of these allotments (ibid.). It is expected that habitat values of riparian and aquatic habitats will be enhanced in these areas as a result of this action.

4.5.3 Analysis of Cumulative Effects

4.5.3.1 Mine Plan Alternatives Set

4.5.3.1.1 Land Use. The land use evaluation of cumulative impacts focuses on two categories: Land Tenure and Visual Resources. Land Tenure focuses upon the changes in federal land ownership that have or are likely to take place in the future on a state-wide basis. The Visual Resources section discusses the likely cumulative impacts to visual resources in the Safford Valley.

- **Land Tenure**

  Proposed Action Alternative. The proposed mining plan of operations will not contribute to cumulative effects that may be associated with the adjustment of land tenure and the resulting changes in land management goals and objectives. Selection of the Proposed Action alternative by the BLM would result in not acquiring the approximately 3,000 acres of lands within Long-Term Management Areas (LTMA) and the potential benefits that result from changes in land management

goals and objectives for these properties. Selection of this alternative by the BLM will also result in no disposal of 17,000 acres of public lands, some of which could be subject to patent in the future. After considering historic changes in public land tenure in Arizona and the resource management benefits that have occurred as a result, significant cumulative impacts are not expected from the selection of the Proposed Action alternative. Some portion of the 17,000 acres of selected lands could be subject to privatization through the patent process should the congressional moratorium be lifted at some time in the future.

Permitting of the Proposed Action alternative by the COE and EPA would result in no cumulative effects upon land tenure.

Partial Backfill Alternative. Cumulative impacts that would result from selection of this alternative are expected to be similar to those identified for the Proposed Action alternative.

No Action Alternative. Under this alternative, the net cumulative increase in lands subject to multiple resource management objectives of the four federal land management agencies since 1964 will still exceed 2.9 million acres. And while selection of the No Action alternative would not result in the acquisition of offered lands nor the disposal of selected lands for the anticipated resource value and/or public lands management benefit, this alternative is not expected to result in significant adverse cumulative effects to federal land tenure. Some portions of selected lands could be subject to privatization by patenting should the current moratorium on second-stage patents be lifted.

- **Visual Resources**

Proposed Action Alternative. The Proposed Action would create landscape features, most notably the development rock stockpiles and the leach pad, that strongly contrast with the form and line of the existing landscape. The color of the development stockpiles and the leach pad will be similar to the colors of the Gila Mountains and would provide a weak contrast to the surrounding terrain. Because of the distance from key observation points, no contrast in the texture of the Proposed Action with surrounding land forms is expected.

When considered in the context of RFFAs anticipated for the Safford Valley, specifically, the potential Lone Star, Dos Pobres sulfide, and the Sanchez projects, the Proposed Action alternative will contribute cumulatively to visual impacts to the northern viewsheds of the Safford Valley. Detailed mine plans for the Dos Pobres sulfide project and the Lone Star project have not been developed and the Sanchez Project MPO would likely be revised substantially prior to the initiation of any mining activity on that property (J. Korolsky, PDSI, pers. comm.). It is expected that collectively, these RFFAs will result in an estimated 11,675 acres of additional mining-related disturbance. Facilities developed as part of these RFFAs will be generally similar in line, form, and color to the Proposed Action. Likely exceptions to this would be the sand-colored tailings impoundment developed as part of the Dos Pobres Sulfide project and the development of the Lone Star open cut which, because of its location near the top of Lone Star Mountain, is expected to be more visible than the pits excavated for the Dos Pobres and San Juan ore bodies on the bajada of the Gila Mountains.

Partial Backfill Alternative. When considering the distance from key observation points and the nature of RFFAs, selection of this alternative will result in cumulative effects similar to those of the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not result in adverse cumulative effects to visual resources in the Safford Valley.

4.5.3.1.2 Physical Resources . The discussions and analysis of cumulative impacts to physical resources are focused upon three distinct resources — Air Quality, Groundwater and Surface Water Resources. The spatial context for this analysis is the Safford Mining District.

- **Air Quality**

Proposed Action Alternative. As outlined in Section 4.3.2.2 of this document, the Proposed Action will create emissions that range from 5.0 to 66.2 percent of the established standards or guidelines (refer to Tables 4-7 and 4-8 from Section 4.3.2.2). Additional development of mine-related RFFAs in the Safford Mining District would potentially increase concentrations of regulated pollutants within the Safford Valley. The degree to which concentrations of these pollutants would increase is a function of the timing of potential new development activities as well as mine design and control technologies implemented for any new development activities. For example, timing is important in that concentrations of some pollutants, such as PM_{10}, that would potentially be generated by development of the Dos Pobres sulfide project may be off-set to some degree by reductions in pollutant concentrations that result from reduced activities at the Dos Pobres/San Juan Project in its later phases.

Development of mine-related RFFAs or other industrial sources of air pollutants in the Safford Valley will require compliance with applicable ADEQ air quality control regulations. Under these regulations, future development of mine-related RFFAs by PDSI would require either modifying the Class II permit that must be obtained for the Dos Pobres/San Juan Project or obtaining a new permit prior to construction. Any permitting action by ADEQ would contain terms and conditions to ensure that the proposed facility will meet all applicable requirements and standards.

Cumulatively, the concentration of certain criteria air pollutants is likely to increase in the Safford Valley as a result of growth and implementation of RFFAs. However, the degree to which pollutant concentrations can increase from regulated activities or sources (including mine-related RFFAs) is regulated and limited by ADEQ. Through their permitting authority, ADEQ must ensure that criteria air pollutant concentrations at process boundaries for mine-related or other industrial RFFAs do not exceed applicable standards.

Partial Backfill Alternative. Cumulative effects to air resources of the Gila River Valley are expected to be similar to those associated with the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not contribute to cumulative impacts to air resources in the Safford Valley.

Groundwater Resources

Proposed Action Alternative. Local and regional groundwater impacts were modeled for an approximately 478 square-mile region that contains the Dos Pobres/San Juan Project (Dames & Moore 1997a, b, d, e, and g). The purpose of the model was to predict what effects, if any, there may be on regional groundwater flow from proposed development of two open-pit mines and groundwater production wells needed to support the mine. The model was not used to predict cumulative effects that would result from potential future development of the Dos Pobres sulfide, Lone Star, or Sanchez projects.

Development of these mine-related RFFAs in the Safford Mining District are likely to result in increased long-term groundwater impacts beyond those predicted for the Dos Pobres/San Juan Project. These increased impacts are likely to result from the short-term impacts associated with increased pumping from production wells, and the longer term impacts associated with development of a deeper pit and/or additional pits within the mining district.

Cumulative impacts to the regional groundwater flow system are not expected to adversely impact known production wells of other municipal or industrial water users within the Safford Valley. Specific impacts to surface water resources as a result of changes in regional groundwater flow associated with implementation of mine-related RFFAs by PDSI are not known at this time. However, impacts from mine-related RFFAs are expected to increase beyond those predicted by the groundwater model for the Dos Pobres/San Juan Project. These effects will be more accurately predicted in the future, as monitoring programs for the Dos Pobres San Juan Project (see Section 4.9 and Appendix F) help to refine the regional groundwater model's predictive capabilities and as each RFFA is subjected to required environmental permitting and review.

Cumulative impacts to regional groundwater quality will be minimized by the protections inherent in Arizona's APP program. Included within APP permits that would have to be issued for any of the mine-related RFFAs in the Safford district will be requirements to:

1. Demonstrate compliance with BADCT design standards to insure that no adverse impacts occur from a potentially discharging facility;
2. Establish points of compliance beyond which the operator must assure ADEQ that groundwater will meet drinking water standards;
3. Establish an alert monitoring system to provide early detection of potential problems;
4. Develop contingency plans that clearly state procedures for implementing remedial actions; and
5. Develop closure plans and post-closure monitoring plans for each potentially discharging facility.

Implementation of these programs will not only protect groundwater systems, but will also contribute to the protection of water quality within the Gila River and Bonita Creek and their tributaries.

Partial Backfill Alternative. Cumulative effects to groundwater resources of the Safford Valley are similar to those associated with the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not contribute to adverse cumulative impacts to groundwater resources in the Safford Valley.

Surface Water Quantity

Proposed Action Alternative. Cumulative adverse impacts to surface water quantity are not expected to result from implementation of the Dos Pobres/San Juan Project. Impacts of the Proposed Action to surface water quantity in the Gila River have been described in detail in Sections 4.3.2.5.1 and 4.3.2.6.1 of this document. Two potential sources of impact were identified: retention/detention features incorporated into the mine's stormwater management facilities, and the cone of depression from pumping and pit development. Some stormwater management features of the mine retain stormwater runoff that comes into contact with mine facilities in order to prevent discharge of pollutants to downstream resources. It has been estimated that on an annual basis these facilities will decrease tributary runoff to the Gila River by approximately 94 af (Dames & Moore 1998f). The second potential source of impact to the river flow is a consequence of the cone of depression that will form in the vicinity of the Project as a result of groundwater pumping during the life of the mine, and the residual impacts to groundwater flow from the mine pit following closure. This impact is expected to gradually reduce the river's surface flows by a maximum of approximately 35.4 af/yr at 416 years after Project initiation.

As indicated in proposed water resources mitigation programs for the Dos Pobres/San Juan Project, future potential impacts to surface water in the Gila River or Bonita Creek would likely be mitigated by PD. Likely mitigation requirements reflect the necessity to recognize and protect the existing water rights of downstream users, including Indian tribes, and the desire to avoid/minimize any potential indirect impacts to threatened and endangered species or designated critical habitat.

As a result of proposed mitigation and monitoring plans (outlined in Section 4.9) that include detailed monitoring and modeling efforts to refine the current understanding of the Project's impacts to the regional groundwater system and the alternate year fallowing program to mitigate for the predicted maximum impact to Gila River flows, the Project is not expected to adversely impact surface water flows in the Gila River.

It is unlikely that mine-related RFFAs within the Safford Mining District would have unmitigated impacts to surface water resources of the Gila River because of:

1. the standing and legal status of aboriginal surface water rights on the Gila River;
2. resource agency concerns for biological resources along the Gila River in the vicinity of the Safford Mining District;
3. Endangered Species Act compliance requirements; and
4. the monitoring, evaluation and mitigation requirements incorporated into the reclamation plan for the proposed Dos Pobres/San Juan Project.

Partial Backfill Alternative. Cumulative effects to surface water resources of the Gila River are similar to those associated with the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not result in adverse cumulative impacts to surface water quantity in the Safford Valley. The surface water resources associated with Tavasci Marsh and Bonita Creek will also not be placed into public ownership and management.

Surface Water Quality

Proposed Action. No significant cumulative impacts to surface water quality are expected from development of the Dos Pobres/San Juan Project because of:

1. The generally positive trends in water quality within the Gila River;
2. Features of the Project that respond to the substantive requirements of the CWA[6], which regulates point source and non-point source discharges to waters of the United States;
3. The requirement of the Project to adhere to the Arizona's Aquifer Protection Permit program, which regulates discharges to ground water resources.
4. Specific management activities[7] currently underway to minimize or eliminate sources of surface water pollution within the Gila River watershed.

The proposed Project design is based upon the 100-yr/24-hr design storm event and BADCT standards, which greatly diminish the potential risk for accidental discharge of contaminants into both surface and groundwater systems. However, no design standard can, with absolute certainty, guarantee that there will not be an accidental discharge. If there is a discharge, it would most likely occur during periods of increased surface water runoff that exceed the design standard. The higher volumes of water associated with a storm event that exceeds Project design standards would likely dilute such discharges. The risks of such discharges are further reduced through implementation of a Spill Prevention Control and Countermeasures (SPCC) Plan and by the distance between the proposed Project and the Gila River, the nearest perennial surface water system. These risks are generally comparable to the risks presented by other municipal, industrial, and agricultural uses within the Upper Gila watershed and combined, could result in potential cumulative impacts to water quality during severe storm events (although this is considered unlikely).

Partial Backfill Alternative. Cumulative effects to surface water resources of the Gila River are similar to those associated with the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not result in adverse cumulative effects to surface water quality in the Safford Valley.

Waters of the United States

Proposed Action Alternative. As discussed in section 4.3.2.6.5, a total of 114.6 acres of waters of the United States will be directly or indirectly impacted by development of the proposed Dos Pobres/San Juan Project. The majority of these impacts are indirect (93.2 acres) and result from stormwater diversions and reduction in contributory watershed area. Only 21.4 acres of waters of the United States will be directly impacted by fill or excavation activities. For waters of the United

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[6] The Clean Water Act includes a number of substantive provisions that regulate the discharge of pollutants to the Gila River. These programs include: Section 401 which requires state the state to certify the discharge of dredged and fill material will not violate state water quality standards; Section 402 which regulates the point source and non-point source discharge of pollutants to waters of the United States; and Section 404 which regulates the discharge of dredge and fill material to waters of the United States. The principal federal agencies responsible for these programs are the EPA and the Corps, both cooperating agencies for this EIS. These agencies would have oversight and permitting authority for all RFFAs that have the potential to discharge pollutants to surface water resources.

[7] These projects include recent APP activities at the Morenci Mine, the Gold Gulch Surface Water Management project, and the "Gila Monster," an interstate watershed program consisting of more than 70 interested parties. The Gila Monster was formed to develop and implement strategies for management of non-point source loadings into the 8,500,000-acre Upper Gila watershed.

States indirectly impacted by the proposed Project, the impact to identified functions is estimated to be a maximum of 50 percent at any point within the areas of indirect impact. Thus, the COE is requiring mitigation for 68 acres of waters of the United States [21.4 acres + (93.2 acres x 0.5) = 68 acres of mitigation].

Development of other foreseeable mining projects in the Safford Mining District (Lone Star, Dos Pobres sulfide, and Sanchez) is estimated to increase the acreage of waters of the United States affected by these projects to approximately 295 acres (including impacts from the Dos Pobres/San Juan Project). The acreage of mitigation required for direct and indirect impacts to waters of the United States from reasonably foreseeable future mining activities in the district, including the Dos Pobres/San Juan Project, is approximately 200 (WestLand Resources, Inc. 1998). This cumulative mitigation requirement is based upon an analysis similar to that used to determine mitigation requirements for the Dos Pobres/San Juan Project.

Partial Backfill Alternative. Cumulative impacts to waters of the United States are expected to be similar to those associated with the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not result in adverse cumulative effects to waters of the United States.

4.5.3.1.3 Biological Resources. The discussions and analysis of cumulative impacts to biological resources are presented in the next two sections. The first evaluates cumulative impacts to Vegetation and Wildlife resources and the second evaluates cumulative impacts to Threatened and Endangered Species and Designated or Proposed Critical Habitat.

- **Vegetation and Wildlife**

Proposed Action Alternative. Given the past impacts to upland and riparian habitats that have resulted from development and continued operation of agricultural activities in the Safford Valley, and the potential impacts that would result from full development of 11,675 acres of mine-related RFFAs, significant cumulative impacts to vegetation and wildlife in the Safford Valley are expected. However, on a regional or statewide scale these impacts are not considered cumulatively significant. This conclusion is supported by:

1. The acquisition of over 2.9 million acres of public lands in Arizona since 1964;
2. The widespread distribution and relatively low value of upland and xeroriparian habitats that will be impacted by proposed development of the Dos Pobres/San Juan Project;
3. Land tenure RFFAs (including the Land Exchange alternative) that would result in a loss of less than one percent of the net increase in federal public lands since 1964; and
4. Legally-mandated changes in the renewable resources management focus and practice by the BLM and the USFS as a result of recent court actions by special-interest groups.

Partial Backfill Alternative. Cumulative impacts to vegetation and wildlife resources are expected to be similar to those associated with the Proposed Action alternative.

No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not result in adverse cumulative effects to vegetation and wildlife resources.

- **Threatened & Endangered Species/Designated or Proposed Critical Habitat**

  Proposed Action Alternative. After consideration of proposed water resources mitigation outlined in Section 4.9, the Proposed Action alternative is not expected to adversely impact threatened or endangered species or to adversely impact proposed or designated critical habitat, and will not contribute to cumulative adverse impacts to these resources.

  Partial Backfill Alternative. Cumulative impacts to threatened and endangered species and designated or proposed critical habitat are not expected.

  No Action Alternative. Selection of the No Action alternative by the BLM, COE, and EPA will maintain the existing conditions of the Dos Pobres and San Juan mine sites and will not result in adverse cumulative impacts to threatened and endangered species or designated or proposed critical habitat.

4.5.3.1.4 Socioeconomic Resources

- **Proposed Action Alternative.** As outlined in Section 4.3.5, socioeconomic effects of the Proposed Action alternative stem from employment and revenue generated by the Proposed Action. The total construction and operations payroll over the life of the Project is estimated to be $214 million. Cumulatively, taxes paid by PD (excluding employee income taxes) for property, sales, income, payroll, construction, and severance taxes will total more than $420 million during the Project's 16-year life.

  From 1995 to 2005, the total number of new households in Graham County is expected to increase by 3,466 (ESI 1997). Implementation of the Proposed Action alternative will create approximately 145 new households; 108 from direct employment and 37 from indirect employment. This represents approximately 5.9 percent of projected population increase and 3.5 percent of the projected new home demand for Graham County.

  For mine-related RFFAs, there are no specific economic data from which to estimate cumulative effects. Conservatively, mine-related RFFAs within the Safford area could extend the direct effects outlined above by an additional 20 years (J. Korolsky, PDSI, pers. comm.). The degree of increased economic activity that results from mine-related RFFAs will be largely dependent upon the degree of overlap that occurs among these mine-related RFFAs.

  Anticipated growth and the subsequent increased demand for public services that would result from the Proposed Action are relatively small percentages of the projected growth for Graham County area for the 1995 to 2005 period. New demands on infrastructure resulting from the Project are disportionately small relative to the increase in tax revenue that would be generated directly and indirectly by the Project and no adverse cumulative impacts are expected.

- **Partial Backfill Alternative.** Cumulative effects of the Partial Backfill alternative would be similar to the effects of the Proposed Action alternative.

- **No Action Alternative.** Selection of the No Action alternative by the BLM, COE, and EPA would not significantly affect the existing and projected growth patterns of the region, however, the Project's significant cumulative economic contributions in the form of various local, state, and federal taxes would not accrue to the economic development of the region. This could be expected to result in adverse cumulative impacts to local and regional socioeconomic conditions.

4.5.3.2 Land Exchange Alternatives Set

Two alternatives are presented: the Proposed Land Exchange alternative and the No Land Exchange alternative. Under the No Land Exchange alternative, BLM's land management responsibility for the selected lands would remain unchanged and mining operations have been assumed to proceed through implementation of the proposed Mining Plan of Operations or the Partial Backfill alternative presented in the Mine Plan Alternatives Set. The true No Action alternative (no mining and no land exchange) is presented as part of the Mine Plan Alternatives Set.

4.5.3.2.1 Land Use. The land use evaluation of cumulative impacts focuses on two categories: Land Tenure and Visual Resources. Land Tenure focuses upon the changes in federal land ownership that have or are likely to take place in the future on a state-wide basis. The Visual Resources discussion centers on the likely cumulative impacts to visual resources in the Safford Valley.

- **Land Tenure**

Land Exchange Alternative. Considering past, present (in process), and RFFA land tenure adjustments by exchange and the nature and values of the resources proposed for public acquisition through the Safford Land Exchange, the exchange alternative is not expected to have a significant adverse cumulative impact to public land tenure and management. Table 4-33 summarizes the net change in acreage of land management responsibilities for both the USFS and BLM that have or are reasonably expected to occur as a consequence of this land exchange as well as others in the foreseeable future.

Since 1964, the BLM, USFS, NPS, and USFWS combined have acquired management responsibility for more than 2.9 million acres of public lands to facilitate and enhance their resource management objectives in Arizona. The land exchanges currently being considered by the BLM and USFS (Table 4-33) continue these management-focused activities (see discussions in section 4.5.2.4 for additional information relating to biological resources on the offered and selected lands). The net reduction in federal lands (27,372 acres) that would result of the land exchanges currently being considered by the BLM and USFS represents less than one percent of the net gain in federal lands in Arizona from 1964 to 1993.

All of the federal land exchanges currently in process or proposed are being evaluated under the guidelines and requirements of NEPA and must be consistent with the broader planning goals and objectives of the lead land management agency. For example, land acquisition objectives by the Safford Field Office are defined by their Resource Management Plan (BLM 1991, 1994). Within this plan, the Safford Field Office has identified 24 LTMAs in which the BLM will intensively retain and manage public lands for their multiple resource values. Within these LTMAs the BLM intends to retain all public land and may seek to acquire state and private lands located therein. Future land acquisitions in the Safford Field Office through either exchange or purchase by the BLM will focus on improving agency management capabilities and protecting critical or important natural resources.

Permitting of the Proposed Action alternative by the COE and EPA, should the BLM select the Land Exchange alternative, will not result in significant adverse cumulative impacts to public lands tenure.

No Land Exchange Alternative. No cumulative impacts are expected as a result of implementation of this alternative. Any effects would be similar to those reported in discussion of the cumulative effects of the proposed mining plan of operations or the partial backfill alternative. With selection of the No Land Exchange alternative by the BLM, approximately 3,000 acres of lands within Long-Term Management Areas (LTMA) will not be acquired and the potential benefits that result from changes in land management goals and objectives for these properties will not be

realized. Selection of this alternative by the BLM will also not result in disposal of 17,000 acres of public lands, some of which could be subject to patent in the future. After considering historic changes in public land tenure in Arizona and the resource management benefits that have occurred as a result, significant cumulative impacts are not expected from the selection of the No Land Exchange Alternative.

- **Visual Resources**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in significant adverse cumulative effects to visual resources in the Safford Valley.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA will create landscape features, most notably the development rock stockpiles and the leach pad, that strongly contrast with the form and line of the existing landscape. The color of the development stockpiles and the leach pad will be similar to the colors of the Gila Mountains and will provide a weak contrast to the surrounding terrain. Because of the distance from key observation points, no contrast in the texture of the proposed action with surrounding land forms is expected. It is expected that collectively, the RFFAs within the Safford Mining District will result in an estimated 11,675 acres of additional mining-related disturbance and implementation of the Proposed Action or the Partial Backfill Alternatives, in conjunction with the proposed land exchange will have cumulative effects.

No Land Exchange Alternative. When considering the distance from key observation points and the nature of RFFAs, selection of this alternative will result in cumulative effects similar to those identified for the proposed land exchange alternative.

4.5.3.2.2 Physical Resources . The discussions and analysis of cumulative impacts to physical resources are focused upon three distinct resource elements — Air Quality, Groundwater and Surface Water Resources.

- **Air Quality**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in adverse cumulative effects to air resources in the Safford Valley.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA would result in the cumulative impacts to air resources described for the Proposed Action alternative.

No Land Exchange Alternative. Cumulative effects to air resources of the Gila River Valley would be the same as those associated with the Proposed Action alternative (the Dos Pobres San Juan Project Mining Plan of Operations).

- **Groundwater Resources**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in significant adverse cumulative effects to groundwater resources in the Safford Valley.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA would result in the cumulative impacts to groundwater resources described for the Proposed Action alternative.

No Land Exchange Alternative. Cumulative effects to groundwater resources of the Safford Valley would be the same as those associated with the Proposed Action alternative.

- **Surface Water Quantity**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in significant adverse cumulative effects to surface water resources in the Safford Valley. Acquisition of the offered lands by the BLM will result in a net gain of surface water rights by the BLM of approximately 700 af/yr. Significant surface water features that will be acquired through the exchange include 324 acres of wetland and adjacent upland habitats at Tavasci Marsh (SWCA 1996b) and 935 acres consisting of the Curtis and Amado properties, which contain hydroriparian and aquatic resources associated with Bonita Creek in the Gila Box RNCA (ibid.).

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA is not expected to result in cumulative adverse impacts to surface water quantity following implementation of mitigation measures outlined in the Habitat Mitigation and Monitoring Plan included as Appendix F to this document.

No Land Exchange Alternative. Cumulative effects to surface water resources of the Gila River would be the same as those associated with the Proposed Action alternative presented in the Mine Plan Alternative Set.

- **Surface Water Quality**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in adverse cumulative effects to surface water resources in the Safford Valley.

Implementation of the RFFAs anticipated for the selected lands following an exchange will require authorization/approval under a variety of federal and state regulations. Under either federal or private land ownership, all mining operations must be conducted in compliance with the substantive federal and state laws that protect environmental quality, including the Clean Water Act (see footnote 1) and Arizona's Aquifer Protection Permit (APP) program under Arizona Revised Statutes Title 49 and Arizona Administrative Code Title 18.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA is not expected to result in cumulative adverse impacts to surface water quality.

No Land Exchange Alternative. Cumulative effects to surface water resources of the Gila River would be the same as those associated with the Proposed Action alternative.

- **Waters of the United States**

Proposed Action Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in adverse cumulative impacts to waters of the United States.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA will result in cumulative adverse impacts similar in scope to those reported for the Proposed Action alternative.

No Land Exchange Alternative. Cumulative impacts to waters of the United States would be the same as those associated with the Proposed Action alternative

4.5.3.2.3 Biological Resources. The discussions and analysis of cumulative impacts to biological resources are focused upon two distinct resources — Vegetation and Wildlife, and Threatened and Endangered Species and Designated or Proposed Critical Habitat.

- **Vegetation and Wildlife**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in adverse cumulative impacts to vegetation and wildlife resources in the Safford Valley. The land exchange would continue state-wide trends in federal land ownership that have placed valuable vegetation and wildlife resources (e.g. Tavasci Marsh and portions of Bonita Creek) or lands that improve manageability of public lands (e.g. lands adjacent to the Dos Cabeza Mountains Wilderness and lands within the Empire-Cienega Resource Conservation Area) into public ownership.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA will result in cumulative adverse impacts similar in scope to those reported for the Proposed Action alternative.

No Land Exchange Alternative. Cumulative impacts to vegetation and wildlife resources would be the same as those associated with the Proposed Action alternative.

- **Threatened and Endangered Species and Designated or Proposed Critical Habitat**

Land Exchange Alternative. Land tenure adjustments associated with the proposed exchange, in and of themselves, will not result in adverse cumulative impacts to threatened and endangered species or proposed or designated critical habitat. Beneficial impacts are expected as a result of the land exchange. Bald eagle, American peregrine falcon, southwestern willow flycatcher, and lesser long-nosed bat are known to occur or are considered likely to occur on several of the offered land parcels (see section 4.4.3.3.2 for additional discussion).

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA is not expected to result in cumulative adverse impacts to threatened and endangered species or proposed or designated critical habitat.

No Land Exchange Alternative. Cumulative impacts to threatened and endangered species and designated or proposed critical habitat are not expected.

4.5.3.2.4 Socioeconomic Resources

- **Land Exchange Alternative.** With the exception of increased property taxes that result from privatization of the selected lands, there are no anticipated cumulative effects within the Safford Area beyond those anticipated for the Proposed Action and Partial Backfill alternatives. Reductions in the property tax payments associated with the offered lands will be offset to a degree by

Payments in Lieu of Taxes (PILT) from the federal government to the counties in which the offered lands are located. As all of these properties are assessed as rural/agricultural/vacant lands, none of the counties are expected to be significantly affected by lost tax revenues.

If the BLM selects the Land Exchange alternative, permitting of either the Proposed Action or the Partial Backfill alternative by the COE and EPA will result in cumulative adverse impacts similar in scope to those reported for the Proposed Action alternative.

- **No Land Exchange Alternative.** Cumulative effects of the No Land Exchange alternative would be the same as those of the Proposed Action alternative.

4.6 IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS OF PUBLIC RESOURCES

This section identifies irretrievable or irreversible commitments of public resources that would likely occur with each of the alternatives. An irretrievable commitment of a resource occurs when the use or productivity of a renewable resource is lost over a limited period of time; for example, grazing suspended in an area during mining activity but resumed through post-mining land uses as rangeland. In this example, the grazing productivity during the period of suspension is irretrievably lost. An irreversible commitment occurs when a nonrenewable resource is permanently lost; for example, the extinction of a species. This analysis of irretrievable or irreversible commitments of public resources is provided in a comparative tabular format for both the Mine Plan Alternatives Set and the Land Exchange Alternatives Set and follows the general organization of resource categories used throughout this document.

4.6.1 Mine Plan Alternatives Set

4.6.1.1 Proposed Action Alternative

Table 4-41 summarizes the irretrievable and irreversible commitments of resources resulting from implementation of the Proposed Action alternative.

4.6.1.2 Partial Backfill Alternative

The Partial Backfill alternative would result in irretrievable and irreversible commitments of resources that are identical to those described for the Proposed Action alternative. The specific nature of these impacts is discussed in detail in earlier sections of this chapter and in Table 4-41.

4.6.1.3 No Action Alternative

This alternative would not irretrievably or irreversibly commit resources of public lands or federal agencies.

Table 4-41. Irretrievable and Irreversible Commitments of Public Resources Associated with the Proposed Action Alternative

Major Category	Subcategory	Irretrievable Commitments of Resources	Irreversible Commitments of Resources
Land Use	Access/ Recreation	Not Applicable	Loss of public access on the San Juan Mine Road; loss of dispersed recreation (hunting, recreational driving) on public lands at mine site; mitigated by upgrading an existing alternate route to public recreation areas
	Grazing	Loss of grazing on 3,234 acres of public lands removed from BLM grazing allotments during life of Project but returned to allotments after mine closure	Permanent loss of 1,935 acres of public lands in BLM grazing allotments due to surface disturbance by mining activity
	Noise and Vibrations	Loss of quiet for short periods daily in Safford area during life of Project due to noise and low-level vibrations from mine blasting	Not Applicable
	Visual Resources	Not Applicable	Modification of natural forms, colors, textures, and structures of the landscape of mine site as seen from the Safford area
Physical Resources	Climate	Not Applicable	On very localized scale, minor changes in wind patterns on mine site resulting from topographical changes
	Air Quality	Reduced air quality in project area during life of Project due to increased emissions for some criteria pollutants	Not Applicable
	Geology (Mineral Potential)	Not Applicable	Loss through extraction of most known metallic mineral resources and some aggregates on public lands in project area
	Soils	Loss of productivity of soils (all poor quality) on public lands stockpiled until used for concurrent and post-mine reclamation efforts	Loss of soils (all poor quality) from public lands removed or covered during mine development but not stockpiled for reclamation purposes
	Groundwater Quantity	Lowered groundwater surface elevation due to pumping at Project; commitment of resource reversible but not in a realistic human time frame (>500 yr); effects on Gila River flow mitigated	Not Applicable

Table 4-41 (continued). Irretrievable and Irreversible Commitments of Public Resources Associated with the Proposed Action Alternative

Major Category	Subcategory	Irretrievable Commitments of Resources	Irreversible Commitments of Resources
Physical Resources, cont.	Surface Water Quantity	Reduced water flow (94 af/yr max) in some washes due to stormwater diversions on the mine site; while this commitment of resource is reversible, since the Project is a zero-discharge facility, it is essentially irretrievable for the foreseeable future; effects on Gila River flows would be mitigated in perpetuity	Loss of washes and associated surface water flow due to fill and excavation activity during mine development; loss of DP seep; effects on Gila River flow mitigated
	Waters of the U.S.	Same as above; 93.2 acres of jurisdictional waters affected	Same as above; 21.4 acres of jurisdictional waters lost
Biological Resources	Vegetation	Loss of productivity of an unquantified amount of Sonoran Desertscrub, Sonoran Desertscrub/ semidesert Grassland Ecotone, and Xeroriparian vegetation on parts of mine site slated for reclamation until those areas are revegetated as a result of human effort or natural processes	Loss of an unquantified amount of Sonoran Desertscrub, Sonoran Desertscrub/semidesert Grassland Ecotone, and Xeroriparian vegetation from unreclaimed areas of mine site (pits).
	Wildlife	Reduced wildlife presence in project area due to lost habitat as described above and noise, nighttime lighting, and other human activity during life of Project	Reduced wildlife presence due to lost habitat as described above or destruction of wildlife, particularly small animals like invertebrates, reptiles, or rodents, due to mining activity
	Special Interest Species	Not Applicable	Due to surface disturbance by mining activity, loss of mine features potentially used by special status bats, loss of population of Indian globe-mallow, and loss of some Gila monster habitat and individuals
Cultural Resources	Archaeological Sites	Not Applicable	Loss of 12 archaeological sites on public lands, 21 on PD land, and 1 on state land due to surface disturbance by mining activity; potential loss of scientific information mitigated by archaeological investigations
	Traditional Cultural Properties	Not Applicable	Loss of 9 sites on public lands and 14 sites on PD land identified as TCPs by Indian tribes; consultation for mitigation ongoing

4.6.2 Land Exchange Alternatives Set

4.6.2.1 Land Exchange Alternative

The Land Exchange alternative itself would be an irretrievable and irreversible commitment of public selected lands and their resources. The specific nature of these impacts on land use, and physical, biological, cultural, socioeconomic, and Indian trust resources is discussed in detail in earlier sections of this chapter, along with discussion of proposed mitigation for adverse impacts. There would also be an irretrievable loss of BLM authority for management of the public resources on the selected lands; however, federal oversight for future land uses on the selected lands as private lands is required for activities subject to compliance with the Clean Water Act, the Clean Air Act, and other federal laws and regulations.

While acquisition of the offered lands is not mitigation, *per se*, for loss of the selected lands, the resources of the lands acquired by the public are meant to provide public benefit and value equal to or beyond those values associated with the selected lands.

The foreseeable uses of the selected lands would have irretrievable and irreversible commitments of resources described in part in Section 4.6.1.1 above. Additional irretrievable and irreversible commitments of resources similar to these would be expected if the foreseeable uses at Dos Pobres sulfide and Lone Star were implemented in the future.

4.6.2.2 No Land Exchange Alternative

This alternative would not, in and of itself, irretrievably or irreversibly commit any resources associated with the selected or offered lands. It would commit BLM personnel to subsequently make a decision regarding the one of the mine plan alternatives, and given the regulations at 43 CFR 3809, it is likely that a mine plan alternative would be authorized.

4.7 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

This section identifies the impacts to long-term productivity of resources resulting from the short-term uses proposed by the alternatives in both the Mine Plan Alternatives Set and the Land Exchange Alternatives Set. Long-term productivity refers to the ability for continued production or sustained yield of a resource (i.e., the productivity of renewable resources). Short-term uses include activities such as mineral extraction, timber and fuelwood harvesting, recreation uses, livestock grazing, and special land uses. The analysis is focused on impacts of the alternatives on renewable resources, such as soils, vegetation, and surface and groundwater quantity and quality, upon which productivity is generally based.

4.7.1 Mine Plan Alternatives Set

4.7.1.1 Proposed Action Alternative

The mineral extraction activities proposed in this alternative would affect the long-term productivity of some soils, vegetation, and both surface and groundwater resources on the public lands proposed for mining. The long-term productivity of most soils and vegetation resources in the proposed mining areas would be permanently lost through surface disturbance, burial under stockpiles or leach pad, or other construction. These impacts would subsequently have long-term, but localized adverse impacts on other resources, such as wildlife and wildlife habitat, grazing capacity, some dispersed recreational opportunities, and on public

access within those disturbed areas. Reclamation measures, such as revegetation and removal of structures and roads, would mitigate this loss of soil and vegetation productivity to some degree.

Impacts to the long-term productivity of surface and groundwater quantity are evidenced by the anticipated long-term lowering of groundwater elevations in the region of the Project. While the consequent impacts of this on surface water quantity in the Gila River can and would be mitigated (see Appendix F), this long-term change in groundwater gradients in the project area resulting from the cone of depression and mine pits would potentially affect the long-term yield and availability of groundwater to current and future users of this resource.

Impacts to the long-term productivity of surface and groundwater quality have been minimized through a variety of environmental protection measures, such as the use of liner systems; secondary containment systems; stormwater diversions and detention and retention basins; application of BADCT criteria for design, construction, and operation of potentially discharging facilities; and operation of the Project as a non-discharge facility under Section 402 of the Clean Water Act. Thus, the current quality of the surface and groundwater resources is expected to be maintained and with it its long-term productivity as a renewable resource.

4.7.1.2 Partial Backfill Alternative

This alternative would be expected to result in identical impacts to long-term productivity of soil, vegetation, and water resources as the Proposed Action alternative.

4.7.1.3 No Action Alternative

This alternative would have no impact on the long-term productivity of soils, vegetation, and water resources.

4.7.2 Land Exchange Alternatives Set

4.7.2.1 Land Exchange Alternative

In a strict sense, a land exchange alternative does not involve any "short-term uses" of resources; public lands would be placed permanently into private ownership. As such, this alternative, which is a realty action, would not affect the long-term productivity of soil, vegetation, or water resources of the selected lands. However, foreseeable uses of the selected lands (mining) would result in the same impacts to long-term productivity as those described for the Proposed Action alternative and would also include similar impacts to productivity of resources on the Dos Pobres Sulfide and Lone Star areas of the selected lands that would occur later in time. The long-term productivity of renewable resources acquired on the offered lands would benefit from this alternative, as BLM's "management [of public lands] is based upon the principles of multiple use and sustained yield...."

4.7.2.2 No Land Exchange Alternative

This alternative, in and of itself, would have no impacts on the long-term productivity of resources on federal lands. However, since mining is a reasonable assumed future use of the selected lands given the BLM's subsequent requirement to select a mine plan alternative, the impacts to long-term productivity would be identical to those described under the Proposed Action. The long-term productivity of the offered lands would be subject to private management by PDSI.

4.8 UNAVOIDABLE ADVERSE IMPACTS

This section describes the potentially adverse impacts resulting from the Project or its alternatives that are unavoidable. Unavoidable impacts are those impacts that remain following the implementation of all applicable mitigation measures.

4.8.1 Mine Plan Alternatives Set

4.8.1.1 Proposed Action Alternative

Because of mitigation measures developed as part of the NEPA process and in compliance with Clean Water Act Sections 404 and 402 permitting requirements (e.g., Habitat Mitigation and Monitoring Plan, federal trust responsibilities for Indian Trust Resources, etc.), unavoidable adverse impacts of the alternatives presented in this EIS would be limited to the following:

- temporary loss of grazing on 3,234 acres of public lands, and permanent loss of 1,935 acres of grazing on public lands;
- major modifications to the landscape (e.g., development rock stockpiles, leach pad, open pits, nighttime lighting) whose visual impacts have been reduced to some degree by mitigation measures but not entirely;
- increased noise and vibrations resulting from mine blasting during the 16-year life of the Project;
- long-term drawdown of groundwater elevations and changes in groundwater gradients in the project area (note: the subsequent surface water effects of this impacts are mitigated in perpetuity as described in Appendix F);
- permanent loss of DP seep; and
- destruction of 34 archaeological sites, 23 of which are considered to be traditional cultural properties by Indian tribes. The potential loss of scientific information associated with these sites would be mitigated by archaeological investigations, and the agencies' ongoing consultations with Indian tribes include tribal review and input regarding the BLM's data recovery plan to address adverse impacts to such resources. However, some groups, specifically Indian tribes such as the Hopi and the San Carlos Apache, consider destruction of sites to be unmitigable.

4.8.1.2 Partial Backfill Alternative

This alternative would have the same unavoidable impacts as those described for the Proposed Action alternative.

4.8.1.3 No Action Alternative

This alternative would have no unavoidable adverse impacts.

4.8.2 Land Exchange Alternatives Set

4.8.2.1 Land Exchange Alternative

The land exchange itself would have no unavoidable adverse impacts; foreseeable uses of the selected lands would result in the same unavoidable adverse impacts to resources as those described for the Proposed Action alternative.

4.8.2.2 No Land Exchange Alternative

This alternative, in and of itself, would have no unavoidable adverse impacts. However, the unavoidable adverse impacts of the Proposed Action alternative would be presumed to occur, given the BLM's requirement to make a subsequent decision regarding a mine plan alternative.

4.9 MITIGATION

This section summarizes the proposed mitigation measures for direct and indirect impacts resulting from the action alternatives considered in this document (Table 4-42). Detailed mitigation and monitoring measures for impacts to waters of the U.S. and other water resources are provided in Appendix F.

Table 4-42. Proposed Mitigation Measures for Impacts of Action Alternatives for the Dos Pobres/San Juan Project (N/A = mitigation not applicable since this alternative would not cause an impact)

IMPACTS		PROPOSED MITIGATION MEASURES		
		Mine Plan Alternatives Set		Land Exchange Alternatives Set
Subcategory	Issue/Impact	Proposed Action Alternative	Partial Backfill of San Juan Alternative	Land Exchange Alternative*
LAND USE				
Public Lands Management	Loss of BLM jurisdiction over selected lands.	N/A	Same as for Proposed Action.	No mitigation required.
Access and Recreation	Loss of public access on San Juan Mine Road to Gila Mountains.	Although an alternate access route is still available, PD is evaluating the feasibility of upgrading portions of the existing Solomon Pass Road to accommodate fair-weather travel of 2-wheel-drive passenger vehicles to the Gila Mtns. as mitigation. Other mitigation measures for this impact include BLM retaining easements on portions of West Ranch and Salt Trap Tank roads to provide continued access to the Gila Mtns and Gila Box.	Same as for Proposed Action.	Same as for Proposed Action.
	Loss of dispersed recreational opportunities on public lands.	PDSI would provide 'scenic overview' opportunities as part of educational/tourism post-mining land uses. No other specific mitigation is proposed.	Same as for Proposed Action.	Recreational opportunities gained on offered lands compensate for this loss.
Grazing	Reduced stocking capacity and loss of use of range improvements within proposed security fence.	Mitigation (i.e., payment) would be made to the appropriate party(s) for the eight registered range improvements directly impacted by the proposed mining operations (i.e., those improvements located within the proposed security/grazing fence). No mitigation for reduced stocking capacity.	Same as for Proposed Action.	Same as for Proposed Action.
Surface Water Rights	Loss of use of surface water rights for stockwatering and wildlife purposes on public lands within security fence.	Assignees other than BLM or PD holding any of the 17 surface water rights on public lands within the proposed fenced area around the mining operations would be compensated for loss of the use of these rights.	Same as for Proposed Action.	Same as for Proposed Action.
Visual Resources	Major modifications to the landscape in the Safford Valley.	Mitigation for visual impacts include revegetation of portions of development rock stockpiles as described in Reclamation Plan (PDSI 1997), as well as the following measures: 1) use earth-toned paint colors for buildings to reduce their visibility; 2) recontour the land disturbed for road cuts and fills, stormwater diversions, impoundment dams, borrow areas, stockpiles, and other facilities; and 3) recontour the sharp angles of the corners and edges of the front, sides, and tops of the pad and stockpiles as described in Reclamation Plan to reflect the natural flow of adjacent landforms.	Same as for Proposed Action.	N/A
Hazardous Materials	Risk of contamination by hazardous materials.	To minimize risks associated with hazardous materials, all such materials would be transported, handled, stored, and disposed of per requirements of MSHA, RCRA, and CERCLA (see Sections 2.1.2.3.5 to 2.1.2.3.8). The shipping company selected by PDSI to transport hazardous materials would be required to comply with applicable federal and state regulations governing such transport. PDSI would develop a Spill Prevention Control and Countermeasures (SPCC) Plan to address requirements for preventing accidental spills and developing procedures to be followed in the event of a spill. Upon closure of the mines, PDSI would be required to properly remove and dispose of hazardous materials from the mine sites per APP and reclamation requirements.	Same as for Proposed Action.	N/A

Table 4-42 (continued). Proposed Mitigation Measures for Impacts of Action Alternatives for the Dos Pobres/San Juan Project (N/A = mitigation not applicable since this alternative would not cause an impact)

IMPACTS		PROPOSED MITIGATION MEASURES		
		Mine Plan Alternatives Set		Land Exchange Alternatives Set
Subcategory	Issue/Impact	Proposed Action Alternative	Partial Backfill of San Juan Alternative	Land Exchange Alternative*
PHYSICAL RESOURCES				
Air Quality	Some decrease in ambient air quality but within federal and state standards due to implementation of environmental protection measures.	Environmental protection measures incorporated into the MPO include dust control at crushing and screening facilities and at ore surge piles consisting of fog nozzles and water-wetting systems to suppress dust, and air pulse dust collection systems to filter dust-laden air. Water trucks would systematically suppress dust on roads. Methods being evaluated by PDSI to control sulfuric acid mist in the tankhouse include heat retention beads and balls, surfactants, water foggers, and cell wipers. Emissions of VOCs during the solution extraction process would be minimized through engineering design and diluent selection for low vapor pressure. Boiler combustion gasses would be minimized through use of clean-burning fuels, such as propane and/or natural gas.	Same as for Proposed Action.	N/A
Groundwater Quantity	Lowered groundwater surface elevation that could potentially affect surface water flows.	Mitigation would be required if reduced groundwater availability affected surface water flows and associated legally protected resources such as jurisdictional waters of the U.S., habitat for listed species, designated critical habitat, and/or Indian Trust Assets (water rights). Data collected through a system of monitoring wells would be used to assess project impacts on groundwater flow; adjust the predictive groundwater model; and, if necessary, revise mitigation measures for predicted impacts on surface water flow in the Gila River. Flows at the Watson Wash artesian well would also be monitored and mitigated. (See appropriate sections of this table and Appendix F for specifics.)	Same as for Proposed Action.	N/A
Groundwater Quality	No impacts expected due to implementation of environmental protection measures required by ADEQ's Aquifer Protection Permit. Risk of discharge to groundwater would be reduced by these measures but cannot be eliminated.	Environmental protection measures incorporated into the MPO include such BADCT applications as liner systems for the leach pad, PLS excess solution ponds, and stormwater impoundment; a stormwater impoundment sized for a 100-year, 24-hour storm event and 24-hour power outage; and double containment systems for the SX/EW tankhouse facilities. Groundwater quality would be monitored systematically (Appendix F). APP closure requirements include permanent strategies to control run-on, runoff, and infiltration.	Same as for Proposed Action.	N/A
Surface Water Quantity	Model-predicted reductions in surface water flows in the Gila River	Fallowing farmland that PDSI owns in the Safford Valley would offset predicted impacts to surface water flows in the Gila River. The net effect of the alternate-year fallowing program (see Appendix F) would be to leave water in the river that would have otherwise been diverted for irrigation. The alternate-year fallowing program would be implemented in perpetuity and protected by placing deed restrictions on lands incorporated in the program. Since the river is fully appropriated, it might be possible for others to use water resulting from PDSI's fallowed land program. To avoid this, the fallowing program would focus on foregoing the use of natural flow water rights during months in which water is flowing past diversion points in the river and into the San Carlos Reservoir, typically January through April. The acreage of land that would be necessary to achieve the targeted mitigation goal during periods of natural flow in the river is greater than the acreage of land needed to meet this goal based upon annual consumptive use estimates. Therefore, this mitigation approach is expected to extend the benefits that result from fallowing agricultural lands throughout the rest of the year.	Same as for Proposed Action.	N/A
	Model-predicted reductions in surface water flows at the Watson Wash artesian well.	Predicted reduction of wellhead pressure would be mitigated by reducing the height of the well discharge pipe by the appropriate amount to maintain surface flows at the current volume.	Same as for Proposed Action.	N/A
	Placement of fill into waters of the U.S. from mining activities.	Mitigation measures have been proposed for a total of 68 acres of impacts to waters of the U.S. as described in Appendix F. Habitat mitigation objectives include creation of 30 acres of riparian habitat, enhancement of 18 acres of riparian and wetland habitat; and preservation of 160 acres of riparian habitats along the Gila River.	Same as for Proposed Action.	N/A
Surface Water Quality	No impacts expected due to implementation of environmental protection measures required by CWA Sections 401 (state certification) and 402 (NPDES permit).	Environmental protection measures incorporated into the MPO include operating the Project as a non-discharge facility (per Section 402 of the CWA), using BADCT criteria for the design, construction, and operation of all potentially discharging facilities. The stormwater management system would be sized for a 100-year, 24-hour storm event and 24-hour power outage.	Same as for Proposed Action.	N/A

Table 4-42 (continued). Proposed Mitigation Measures for Impacts of Action Alternatives for the Dos Pobres/San Juan Project (N/A = mitigation not applicable since this alternative would not cause an impact)

IMPACTS		PROPOSED MITIGATION MEASURES		
		Mine Plan Alternatives Set		Land Exchange Alternatives Set
Subcategory	Issue/Impact	Proposed Action Alternative	Partial Backfill of San Juan Alternative	Land Exchange Alternative*
BIOLOGICAL RESOURCES				
Vegetation	Loss of upland habitat (grubbing) and xeroriparian habitat (scouring, dewatering).	Air quality permit requirements and reclamation measures to restore vegetation on some facilities (including soil stockpiles for dust control) would help to mitigate for these impacts. As described above, COE requires mitigation for impacts to habitat resulting from impacts to waters of the U.S.	Same as for Proposed Action.	N/A
Special Interest Species	Potential impacts to habitats/critical habitat for special interest species.	Potential impacts to Gila topminnow due to reduced wellhead pressure (i.e., reduced flow) at the Watson Wash artesian well would be mitigated by reducing the height of the well discharge pipe by the same amount (Appendix F). Implementation of mitigation measures in the proposed Habitat Mitigation and Monitoring Plan (Appendix F) will reduce any potential for indirect impacts to listed species, such as southwestern willow flycatcher, that are known to occur along the Gila River.	Same as for Proposed Action.	No specific mitigation measures are expected as a result of the Section 7 consultation with USFWS for the loss of federal jurisdiction over *Echinocereus* sp. It is likely that foreseeable mining activities on selected lands potentially impacting this species would require federal permits, and another consultation with USFWS under Section 7 of the Endangered Species Act would be required.
Wildlife	Potential adverse impacts to wildlife from exposure to excess process solution improvement.	PDSI will monitor potential wildlife use of the process solution improvement for one year. Should monitoring results indicate that significant adverse impacts are occurring to wildlife, appropriate mitigation measures would be implemented.	Same as for Proposed Action	N/A
CULTURAL RESOURCES				
Archaeological Sites and TCPs	Destruction of 12 archaeological sites on public lands, 21 sites on private lands, and 1 site on state land. Loss of 23 sites identified as TCPs by Indian tribes: 9 on public lands and 14 on private lands.	Some archaeological sites may be avoided by judicious placement of certain mine facilities, such as access roads, transmission line poles, etc. Mitigation for sites that cannot be avoided consists of implementing a testing and data recovery plan that is being developed by the BLM with input from Indian tribes that have consulted with BLM for this Project. The purpose of testing and data recovery (which itself destroys a site) is to gather as much information as possible from the sites before they are physically impacted by the Project. Twenty-three of the 34 affected archaeological sites have been identified as traditional cultural properties by Indian tribes. Mitigation for sites determined eligible to the National Register as TCPs would be developed through ongoing consultation between BLM and the relevant tribes.	Same as for Proposed Action.	N/A
	Loss of BLM (federal) jurisdiction over 117 archaeological sites on the selected lands, including 74 sites identified as TCPs by Indian tribes. Two of the 74 sites were also identified as sacred places.	N/A	N/A	Loss of federal jurisdiction over the 117 archaeological sites on the selected lands and potential destruction of any of those sites by foreseeable mining uses would be mitigated by implementing a testing and data recovery plan developed with input from Indian tribes that have consulted with BLM for this Project. Mitigation for sites determined eligible to the National Register as TCPs would be developed through ongoing consultation between BLM and the relevant tribes. PD has agreed to avoid the 2 sacred sites when developing foreseeable uses of the selected lands and to allow access to them for ceremonial purposes.

Table 4-42 (continued). Proposed Mitigation Measures for Impacts of Action Alternatives for the Dos Pobres/San Juan Project (N/A = mitigation not applicable since this alternative would not cause an impact)

IMPACTS		PROPOSED MITIGATION MEASURES		
		Mine Plan Alternatives Set		Land Exchange Alternatives Set
Subcategory	Issue/Impact	Proposed Action Alternative	Partial Backfill of San Juan Alternative	Land Exchange Alternative*
SOCIOECONOMIC RESOURCES				
Taxes	Net loss of private property tax income to Pima, Santa Cruz, and Yavapai Counties (Net gain for Graham and Cochise Counties).	N/A	N/A	This impact would be offset partly through Payments in Lieu of Taxes (PILT) from the federal government to counties for federal land holdings; no other mitigation is proposed.
Transportation	Degraded pavement and decreased safety on parts of Safford-Bryce Road.	The Proposed Project would result in substantial payments by PDSI in state and local taxes that fund road repair.	Same as for Proposed Action.	N/A
INDIAN TRUST RESOURCES				
Indian Trust Assets	Potential adverse impacts to Indian holders of priority water rights on the Gila River.	Implementation of the mitigation program for model-predicted reductions in surface water flows in the Gila River from groundwater pumping and surface water diversion would eliminate the potential for adverse impacts to holders of priority water rights on the Gila River. No additional mitigation is necessary.	Same as for Proposed Action.	N/A
	Model-predicted impacts to groundwater elevations on the San Carlos Apache Reservation.	Groundwater surface elevations would be monitored at wells between the mines and the San Carlos Apache Reservation to assess the accuracy of model predictions (see Appendix F, Table 4 - Group 4 wells).	Same as for Proposed Action.	N/A

* This column applies only to the proposed land exchange *per se*; foreseeable uses of the selected lands are not included. For mitigation of impacts attributable to foreseeable uses associated with the Dos Pobres/San Juan Project, see under "Proposed Action." Any mitigation for impacts attributable to foreseeable uses associated with development of the Dos Pobres Sulfide and Lone Star deposits would be determined at the time of federal permitting for those projects.

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Chapter 5: Consultation and Coordination

CHAPTER 5

CONSULTATION AND COORDINATION

The project team's efforts to consult and coordinate with potentially interested/affected publics include two separate scoping periods. An initial scoping was conducted November 1994-January 1995 when the proposed action was a BLM land exchange only, and a second scoping effort was conducted August-October 1996 after PD submitted the Dos Pobres/San Juan Plan of Operations. During both scoping efforts, input was solicited and received from federal, state, and local agencies; elected representatives; tribal officials; non-governmental organizations; and private individuals. This chapter summarizes both efforts to notify and involve potentially interested or affected parties of the proposed Project.

5.1 PUBLIC PARTICIPATION AND SCOPING

The initial Public Participation Plan (PPP) for the Project was approved by the BLM's State Director on October 25, 1994, as part of the BLM's EIS Preparation Plan for the Safford Land Exchange. A revised PPP was approved on July 23, 1996, as part of the BLM's EIS Preparation Plan for the Dos Pobres/San Juan Project. The objective of both PPPs was to identify the efforts to be used to notify potentially interested parties of the proposed Project and provide opportunities for public involvement in the environmental analysis process. The primary public scoping elements of both PPPs are described below.

5.1.1 Publication of a Notice of Intent (NOI)

Two formal Notices of Intent (NOIs) to Prepare an EIS were published in the *Federal Register* for this Project. The first NOI was published on November 3, 1994; the second, on July 31, 1996. Both NOIs briefly described the proposed action, provided 30-day advance notice of scheduled public meetings in which public comments on the Project were being solicited, indicated the closing date for receipt of scoping comments, and provided a contact name and telephone number for those wanting more information or wishing to submit comments to the BLM's Safford Field Office.

5.1.2 News Release

For the first scoping effort, a news release was sent in November 1994 to media within the state, and an informational letter was mailed to approximately 1,400 persons, groups, agencies, tribes, and officials potentially interested in the proposed land exchange. The mailing list was developed from a master list maintained by the Safford Field Office and supplemented with names of owners of properties adjacent to the selected and offered lands. A second news release notifying the public of the change in scope of the proposed action was mailed in August and September 1996. The second mailing list included the initial list plus the media and COE's Phoenix Branch mailing list.

In addition to describing the proposed Project and extending a general invitation to the public to attend scheduled open-house public meetings, each news releases gave the closing date for the scoping comment period (January 17, 1995, and October 12, 1996, respectively, for the initial and rescoping periods).

Table 5-1. Federal, State, and Local Agencies Contacted for this Project

Federal	State	Local
U.S. Army Corps of Engineers Los Angeles District, Regulatory Branch (Cooperating Agency)	Arizona Agriculture and Horticultural Department	Graham County Planning and Zoning Department
Environmental Protection Agency Region IX (Cooperating Agency)	Arizona Department of Environmental Quality	Graham County Sheriff's Department
Bureau of Indian Affairs Phoenix Area Office (Cooperating Agency)	State Historic Preservation Office	
U.S. Fish and Wildlife Service Phoenix Branch Office	Arizona Department of Water Resources	
National Park Service Tuzigoot National Monument	State Mine Inspector's Office	
Natural Resources Conservation Service	Arizona Geological Survey	
Bureau of Reclamation Lower Colorado Regional Office	Arizona State Land Department	
National Forest Service Coronado National Forest Apache-Sitgreaves National Forests	Arizona Department of Mines and Mineral Resources	
Bureau of Indian Affairs Agency Offices, Arizona	Arizona Department of Transportation	
	Arizona Game and Fish Department	
	Arizona State Parks Department	

5.1.3 Agency Coordination

Letters were sent in November 1994 and in early September 1996 to the state and federal agencies listed in Table 5-1 describing the Project and requesting their relevant comments.

BLM's efforts to coordinate with the Arizona State Historic Preservation Office, BIA, and Indian tribes regarding the identification and treatment of cultural resources, and with the U.S. Fish and Wildlife Service regarding potential impacts to threatened and endangered species, are ongoing throughout the NEPA process.

5.1.4 Public Scoping/Open House and Tribal Information Meetings

During the initial public scoping, in 1994, four open-house public meetings were held, one each in Safford, Clifton, Phoenix, and Tucson on December 6, 7, 13, and 15, respectively, to inform the public about the Project and solicit comments. During the second scoping, in 1996, three public open-house meetings were held, one each in Safford, Tucson, and Phoenix on September 5, 10, and 11, respectively. Each meeting lasted four hours to provide adequate opportunities for the public to attend and receive information about the Project. Open-house meetings were advertised through publication of the NOIs in the *Federal Register*, legal notices in local papers, the aforementioned mailers to potentially interested parties, and radio announcements in the Safford-Clifton area.

For both sets of meetings, participants were asked to sign in and were provided with a Project information sheet and a comment form. The information sheets briefly described the Project, identified the lead agency and the Project proponent, and included a statement written in Spanish indicating that information about the Project was available in the Spanish language through the BLM contact person. A total of 141 and 183 individuals attended the initial and second scoping meetings, respectively.

Additionally, presentations were made in September and October 1994 to the Land and Water Resources Committee of the Gila River Indian Community and to the San Carlos Apache Tribal Council to inform these tribes of the Project and to determine whether each tribe wanted public meetings held on their respective reservations. Both tribes independently requested informational presentations rather than public meetings. Twenty-two tribal representatives from the San Carlos Apache Tribe and seven from the Gila River Indian Community attended presentations made on December 7 and 13, 1994, respectively, at each reservation. Attendees were asked to sign in and were given the information sheet and comment form provided at the public scoping meetings.

During the rescoping, in September 1996, the BLM sent letters to the San Carlos Apache Tribe, White Mountain Apache Tribe, Gila River Indian Community, Ak-Chin Indian Community, Salt River Pima-Maricopa Indian Community, Tohono O'odham Nation, Hopi Tribe, and Zuni Pueblo, asking if these tribes had any interest in, and wished to consult on, the Project. The BLM also offered to give presentations about the Project to tribal representatives. By January 17, 1997, four tribes had responded with requests for presentations (the Gila River Indian Community, the Ak-chin Indian Community, Salt River Pima-Maricopa Indian Community, and the Tohono O'odham Nation). On December 20, 1996, the BLM presented information about the project to representatives of these tribes. The BLM also contacted the Navajo Nation, Mescalero Apache Tribe, and Fort Sill Apache Tribe to ask if they had concerns or wished to consult on the Project. Based on tribal responses, the BLM and third-party consultant SWCA Inc. have been consulting with all eleven tribes through meetings, telephone calls, and field trips to the project area. Consultations have been conducted primarily with tribal staffs and elders and have focused on identification of traditional cultural properties, Indian trust resources, and other Native American values. Potential impacts to these resources have been discussed and avoidance/mitigation recommendations have been provided by the tribes. Consultations on mitigation are continuing.

5.1.5 Public Outreach Activities

For the initial scoping in 1994, the BLM developed a public affairs plan for the Project and undertook public outreach efforts that involved appearances by BLM personnel on local radio talk shows, announcements on local radio, and presentations to civic organizations. These public outreach activities extended beyond the initial 30-day comment period.

For the rescoping effort, public outreach was limited to efforts by the Safford Field Office Manager and Area Manager to inform local community leaders through a community forum of the changes to the Project.

5.2 ENVIRONMENTAL JUSTICE

All federal agencies must comply with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." As defined by the BLM and EPA, compliance involves "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA Office of Federal Activities 1997). The goal of "fair treatment" is "to identify

potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts" (ibid.).

For this EIS, compliance with Executive Order 12898 concerning Environmental Justice was accomplished through several means. The first set of these focused on informing the widest possible cross section of the potentially interested public about the Project, and providing opportunities for input from not only the general public but members of local and regional ethnic minority and low-income populations. Efforts targeting these populations included 1) making information about the proposed Project available in the Spanish language during both scoping periods; 2) contacting 11 Indian tribes regarding their concerns about the Project and making several special presentations to tribal representatives on nearby reservations; and 3) making extensive use of local radio in Safford and surrounding communities to disseminate information about the Project and announce public meetings. Radio reaches a wide spectrum of individuals across income lines.

In addition to these efforts, an analysis was conducted to determine if the Project would have disproportionate adverse effects on ethnic minority and/or low-income groups, including Native Americans. Result of such an analysis depends in part upon its scale. For example, on a statewide basis, it could be concluded that the Project disproportionally affects (either positively or negatively) low-income populations because Project impacts are concentrated in Graham County, and Graham County has a disproportionately poor population compared to the rest of the state. In 1990, Graham County ranked 13 out of the 15 counties in Arizona for both median household income and median per capita income, and had the fourth highest rate of persons in poverty (26.7 percent).

However, an analysis on this scale would not take into consideration the fact that the Project, and all reasonable and practicable action alternatives to the Project that meet the purpose and need, can *only* be located in Graham County. The project site is dictated by the location of the Dos Pobres and San Juan copper ore deposits and PD's mining claims. Therefore, the approach to Environmental Justice taken in this EIS is to focus the analysis on populations within Graham County and address other groups only when possible adverse impacts extend beyond county lines. As shown in Section 3.2.5.1.1 of this document, the primary ethnic minority groups in Graham County are Hispanic and Native American. The portions of the county with the greatest concentrations of persons identifying themselves as Hispanic are parts of Safford; parts of Thatcher; and the towns of Solomon, San Jose, and Sanchez. Areas with the greatest concentrations of persons identifying themselves as Native American are the San Carlos Apache Reservation in general and the towns of Bylas and Peridot in particular. Areas with the highest proportion of low-income households are within and just outside the boundary of the San Carlos Apache Reservation, and within pockets in the communities of Safford, Thatcher, and Pima.

Regarding the issues analyzed in this EIS, and relative to other populations in Graham County, residents of the geographic areas cited above are not likely to suffer disproportionately high adverse effects from the Proposed Action and action alternatives. Table 5-2 lists potential direct, indirect, and cumulative adverse impacts identified in Chapter 4 for these alternatives, and identifies the group(s) most affected. In some cases, PD has proposed mitigation for impacts listed in this table (see Appendix F); such mitigation does not influence the conclusion stated above and is not reflected here.

In reviewing the unmitigated direct, indirect, and cumulative impacts of the Project and its action alternatives (including the Land Exchange alternative) in Table 5-2, the project team determined that geographic scope/recipient groups ranged from localized (the project area; BLM allottees) to extremely broad (the American public); that a variety of groups are exposed to potentially adverse impacts of the Project; that most of these groups represent the demographic profile of Graham County or the Safford region; and that no pattern reflecting disproportionately high adverse impacts to low-income and/or minority groups is apparent.

Table 5-2. Summary of Adverse Impacts of the Action Alternatives for the Dos Pobres/San Juan Project: Environmental Justice Analysis

Impact	Proposed Action	Partial Backfill Alternative	Land Exchange Alternative*	Group(s) Affected
Land Use				
Loss of BLM jurisdiction over land use	-	-	✗	public lands users
Reduced public access to the portions of Gila Mountains for recreation	✗	✗	-	BLM allottees, public recreationists/hunters
Reduced grazing	✗	✗	-	BLM allottees
Loss of use of surface water rights within the mine plan footprint	✗	✗	-	BLM allottees
Increased noise and vibrations from mine blasting	✗	✗	-	Safford residents
Modifications to visual resources and views of the Gila Mountains	✗	✗	-	Safford Valley residents
Physical Resources				
Reduced groundwater elevations and surface flows in the Gila River and some of its tributaries	✗	✗	-	Gila River water rights holders
Creation of pit lakes	✗	✗	-	the public
Loss of functions associated with waters of the U.S.	✗	✗	-	the public
Biological Resources				
Loss of vegetation and wildlife habitat	✗	✗	-	public recreationists, hunters
Impacts to T&E species	✗	✗	✗	the public
Cultural Resources				
Archaeological sites	✗	✗	✗	the public; various Indian tribes
Traditional cultural properties	✗	✗	✗	various Indian tribes
Socioeconomic Resources				
Increased demands on infrastructure (schools, utilities, housing)	✗	✗	-	Safford Valley residents; Graham County residents
Indian Trust Resources				
Surface water rights	✗	✗	-	San Carlos Apache Tribe, Gila River Indian Community

* Impacts of the foreseeable mining uses of the selected and offered lands are not attributed to the land exchange alternative because the impacts are not caused by the exchange, simply enabled by it.

For those issues that are of special concern to Indian tribes in the region—notably, Native American archaeological and sacred sites, burials, and traditional cultural properties on potentially affected public lands—the BLM is consulting with the concerned tribes as required by the National Historic Preservation Act (NHPA), Native American Graves Protection and Repatriation Act (NAGPRA), and other federal laws and policies. The San Carlos Apache Tribe has gone on record as opposing an exchange of or mining on the subject public lands (Letter from J.P. Sparks to M.L. Jensen and T. Terry, BLM Safford District, October 11, 1996). The tribe's Elder's Cultural Advisory Council has stated that, among other concerns, "Some of the land parcels involved in this plan are located on land that is currently claimed by the San Carlos Apache Tribe. It would be wrong to continue with the proposed plan while this matter is unresolved....While this mine will provide jobs and money for the near future, it will destroy the land and good health of our grandchildren and future generations....The most important consultation we can give you is to ask you to reexamine the values that this mine represents" (Letter from J. Cassa to M.L. Jensen, BLM Safford Field Office, January 15, 1997). For information on why the San Carlos Apache Tribe land claim was not analyzed as an environmental issue in this EIS, see Section 1.6.2.2.1.

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Chapter 6: List of Preparers

CHAPTER 6

LIST OF PREPARERS

Responsibility	Name	Qualifications
Bureau of Land Management, Safford Field Office Dos Pobres/San Juan Project EIS Interdisciplinary Team		
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Geologist	Larry Thrasher	B.S. Geology, University of Maryland M.S. Geology, University of North Dakota 12 years of BLM experience
Realty Specialist	Scott Evans	B.A. Spanish, Arizona State University 5 years of BLM experience
Wildlife Biologist	Ben Robles	B.S. Wildlife Science, New Mexico State University 20 years of BLM experience
Archaeologist and Native American Coordinator	Gay Kinkade	B.A. History, Ft. Lewis College M.A. Anthropology, Eastern New Mexico University 23 years of BLM experience
Hydrologist	Hana West	B.S. Geography, Northern Arizona University M.S. Watershed Management, University of Arizona 7 years of BLM experience
Hydrologist	Robert MacNish	B.S. Geology, Tufts University M.S. Geology, University of Michigan, Ann Arbor Ph.D. Geology, University of Michigan, Ann Arbor 29 years of USGS experience
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Range Conservationist	Clay Templin	B.S. Range Management, University of Arizona 12 years of BLM experience
Natural Resource Specialist	Christina (Gina) Ramos	B.S. Range Science, New Mexico State University M.B.A. University of Phoenix 17 years of BLM experience

Responsibility	Name	Qualifications
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Fishery Biologist	Jeffrey B. Simms	B.S. Wildlife and Fisheries, University of Arizona M.S. Fisheries Science, University of Arizona 8 years of BLM experience
Air Resources Specialist	Scott F. Archer	B.S. Chemistry, Environmental Science, and Police Administration, Northern Arizona University 17 years of BLM experience
Cooperating Agencies Army Corps of Engineers, Environmental Protection Agency, and Bureau of Indian Affairs		
CWA Section 404 Permit U.S. ARMY CORPS OF ENGINEERS, Los Angeles District Arizona Section Regulatory Branch	Marjorie E. Blaine Senior Project Manager	B.S., Biology and Chemistry, Texas Wesleyan University M.S., Biology, Texas Christian University 18 years of experience
CWA Section 402 NPDES Permit ENVIRONMENTAL PROTECTION AGENCY, Region IX	Laura Gentile Project Manager	B.S. Biology and Chemistry, University of Wisconsin 7 years of EPA experience
	Wendy Melgin Regional Hydrologist	B.A. Geology, University of Montana M.S. Hydrology and Hydrogeology, University of Nevada, Reno 5 years of EPA experience/15 years overall experience
	Karl Kanbergs Environmental Scientist	B.S. Earth Sciences, University of California, Santa Cruz M.S. Economic Geology, University of Arizona M.S., Hydrogeology, University of Nevada, Reno 1 year EPA experience/20 years overall experience
BUREAU OF INDIAN AFFAIRS Phoenix Area Office and Ft. Apache Agency	William Walker Env. Protection Specialist	M.S. Agronomy, Texas A & M University 8 yrs of BIA experience
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	John Krause Haz. Waste Coordinator	B.S., Chemical Engineering, University of Arizona 4 yrs. of BIA experience
	Larry Sibala Indian Water Rights Specialist	B.S., Civil Engineering 8 yrs of BIA experience
	Garry Cantley Area Archaeologist	M.A., Archaeology, Arizona State University 6 yrs of BIA experience

Responsibility	Name	Qualifications
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Responsibility	Name	Qualifications
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CWA Section 404 Permitting and Cumulative Effects WESTLAND RESOURCES	James A. Tress, Jr.	B.S. Biology and Chemistry, Northern Arizona University M.N.S. Plant Ecology, Arizona State University
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Hazardous Materials ZENITECH CORPORATION	Homer M. Hansen	B.S. Ecology and Evolutionary Biology, University of Arizona
	Lucky J. Dittman	A.A., Environmental Sciences, Albuquerque Technical Vocational Institute
Geological Resources and Mineral Potential DAVID E. WAHL, JR.	David E. Wahl, Jr.	B.S. Geology, Louisiana State University M.A. Geology, University of Texas, Austin Ph.D. Geology, Arizona State University
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GLOSSARY

Acre-feet (af). The volume of liquid or solid required to cover one acre to a depth of one foot, or 43,560 cubic feet; measured for volumes of water, reservoir rock, etc.

Activity Plan. A more detailed BLM plan of actions to implement planning decisions over a specified time period; e.g., allotment management plans; recreation area management plans; habitat management plans; or cultural resource project plans.

Adit. A nearly horizontal passage in an underground mine, driven from the surface, by which a mine may be entered, ventilated, and/or dewatered.

Agglomerate. A volcanic breccia formed by disruption of a solidified crust or hardened plug of lava. Blocks may fit together as a loose mosaic or be completely disordered.

Agreement to Initiate a Land Exchange (ATI). A legal document that outlines the agreement between the BLM and a proponent regarding the initiation of a proposed land exchange.

Airshed. The contributing three-dimensional space in which air quality can be evaluated.

Allopatric. Being geographically separate, or nearly so, from another population of the same species.

Allotment. A land area where one or more operators graze their livestock. The allotment generally consists of public land but may include parcels of private and state-owned lands. The number of livestock and season of use are stipulated for each allotment by the landowner.

Alluvial Fan. Made of soil and sand left by rivers or floods.

Alluvium. Unconsolidated or poorly consolidated gravel sands and clays deposited by streams and rivers on riverbeds, flood plains, and alluvial fans.

Andesite. A dark colored, fine-grained extrusive rock that, when porphyritic, contains phenocrysts composed primarily of zoned sodic plagioclase and one or more of the mafic minerals, with a ground mass composed generally of the same minerals as the phenocrysts; the extrusive equivalent of diorite.

Animal Unit Month (AUM). The amount of forage needed to sustain one cow or its equivalent for one month.

Annual (Ephemeral) Plant. A plant that completes its life cycle and dies in one year or less. (Range Term Glossary Committee 1974.)

Appraisal. Act of placing an estimated value on an asset or assets.

Aquifer. A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

Area of Critical Environmental Concern (ACEC). An area of public land where special management attention is required to protect important historic, cultural, or scenic values, fish and wildlife or natural systems or processes, or to protect life and safety from natural hazards.

Arizona Mined Land Reclamation Act. Legislative act passed in 1994 by the Arizona Legislature; established the State of Arizona as the administrator of reclamation regulations for private land within the state and provided statutory authority to the Arizona State Mine Inspector for the development and adoption of Mined Land Reclamation Rules. It requires that metalliferous mining and exploration operations that create surface disturbances greater than five acres must meet the State reclamation regulations.

Artesian Well. A well in which water rises under pressure from a permeable stratum overlaid by impermeable rock.

Artifact. Any object showing human workmanship of modification, especially from a prehistoric or historic culture.

Backfill. Earth, overburden, mine development rock, or imported material used to replace ore or other material removed during mining.

Bajada. Spanish word meaning "step" that refers to a gradually sloping alluvial area of mountains.

Basalt. A dark-colored igneous rock, commonly extrusive, composed primarily of calcic plagioclase and pyroxene; the fine-grained equivalent of *gabbro*. The plagioclase is normally zoned and usually ranges in composition from byrownite to labradorite; augite, pigeonite, and hypersthene are the common pyroxenes. Apatite and magnetite are almost always present, and olivine is common.

Best Available Demonstrated Control Technology (BADCT). Processes, structures, operating methods, or other alternatives developed by EPA and in Arizona, ADEQ, used to design, construct, and operate a facility so as to ensure the greatest degree of discharge reduction achievable, including, where practicable, a technology permitting no discharge of pollutants.

Biome. A climax community that characterizes a particular natural region; esp. A particular type of vegetation, climatically bounded, which dominates a large geographic area.

Bosque. Spanish word for "forest" used to describe a riparian plant association typically found in floodplains and usually dominated by one species, e.g., mesquite.

Cienaga. A marshy area where the ground is wet due to the presence of seepage or springs, often with standing water and abundant vegetation. The term is commonly applied in arid regions such as the southwestern U.S.

Clean Water Act (CWA). The Federal Water Pollution Control Act of 1972, as amended.

Code of Federal Regulations (CFR). The compilation of federal regulations adopted by federal agencies through a rule-making process.

Colluvium. General term applied to loose and incoherent deposits, usually at the foot of a slope or cliff (e.g., talus and cliff debris) and brought there chiefly by gravity.

Community Type. A group of plants living in a specific region under relatively similar conditions.

Compactible Soil. A property of a sedimentary soil that permits it to decrease in volume or thickness under load; it is a function of the size, shape, hardness, and brittleness of the constituent particles.

Concentrator. Facility where ore is crushed, ground, and separated to produce a highly concentrated ore.

Cone of Depression. The depression of heads around a pumping well caused by the withdrawal of water.

Cretaceous. The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), thought to have covered the span of time between 135 and 65 million years ago; also, the corresponding system of rocks.

Critical Habitat. Defined in Section 3(5)(A) of the Endangered Species Act as: "(I) the specific areas within the geographic area occupied by a species...on which are found those physical or biological features (I) essential to the conservation of the species, and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed ... upon a determination by the Secretary that such areas are essential for the conservation of the species."

Cultural Resources. Those fragile and nonrenewable remains of human activity, occupation or endeavor, reflected in district, sites, structures, building, objects, artifacts, ruins, works of art, architecture and natural features that were of importance in past human events. These resources consist of: 1) physical remains, 2) areas where significant human events occurred, even though evidence of the event no longer remains, and 3) the environment immediately surrounding the actual resource.

Cumulative Impact. The impact on the environment which results from incremental impact of the action when added to other past, present, and reasonably foreseeable future actions; cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Delist. To remove a species from the federal list of endangered and threatened species, thereby removing protection of the Endangered Species Act.

Development Rock. Also called overburden or wasterock; nonmineralized rock or rock of low economic value that is removed during mining operations. It is typically stockpiled and used to construct roads, yards, building pads, dams, and embankments.

Dike. 1. A tabular body of igneous rock that cuts across the structure of adjacent rocks or cuts massive rocks. 2. A wall or embankment built around a low-lying area to prevent flooding.

Dip (pertaining to a fault). The angle that a stratum or any planar feature makes with the horizontal, measured perpendicular to the strike and in the vertical plane.

Direct Impact. Effects that are caused by the action and that occur at the same time and place.

Discharge. The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second (cfs), gallons per minute (gpm), or million gallons per day (mgd).

Disposal. Transferring of land out of federal ownership by various methods such as exchange, sale, Recreation and Public Purposes Act, and/or state indemnity selection.

District. A former BLM administrative area composed of one or more resource areas; recently replaced by "field office."

Downlist. To move from top priority to a lower priority of the list.

Drawdown. The lowering of the water level in a well as a result of withdrawal; the reduction in head at a point caused by the withdrawal of water from an aquifer.

Ecotone. The transition zone between two major ecological communities where one does not merge gradually into the other, for example, that between grassland and woodland.

Effects. "Effects" include a) Direct effects, which are caused by the action and occur at the same time and place. b) Indirect affects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

Electroshocking. Field method for assessing fish populations within a body of water.

Electrowinning. The process of electrolytically depositing metals, or separating them from their ores or alloys.

Endangered or Threatened Species. Any species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act would present an overwhelming and overriding human risk. A threatened species is any species likely to become endangered within the foreseeable future throughout all of a significant part of its range.

Eocene. An epoch of the Tertiary period, after the Paleocene and before the Oligocene, covering a span of time from about 55 to 35 million years ago.

Environmental Impact Statement (EIS). A detailed statement required by the National Environmental Policy Act (NEPA) when an agency proposes a major federal action significantly affecting the quality of the human environment. There is usually a Draft EIS followed by a Final EIS.

Equal Monetary Value. The dollar value of the selected and offered lands must be within 25 percent of each other.

Ephemeral Stream. A stream or portion of a stream that flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the water table.

Erosion. The wearing away of soil and rock by weathering, mass wasting, and action of streams, glaciers, waves, wind and underground water.

Evaporation. The portion of precipitation returned to the air in the form of vapor.

Evapotranspiration. An amount of water lost to the atmosphere that is consumptively used by plants through transpiration and water evaporated from bare soils.

Exploration. The search for economic deposits of minerals, ore, and other materials through practices of geology, geochemistry, geophysic, drilling, and/or mapping.

Fault. A fracture in rock units along which there has been displacement.

Field Office. BLM's geographic and administrative divisions within a state; formerly BLM Districts.

Flaked Stone. Debitage resulting from lithic tool manufacture.

Fluvial. Of or pertaining to rivers; growing or living in a stream or river; produced by the action of a stream or river.

Form. The mass of shape of an object or objects which appear unified, such as a vegetative opening in a forest, a cliff formation, or a water tank.

Fugitive Emissions. Hydrocarbon emissions released into the atmosphere from any point other than a stack, chimney, vent, or other functionally equivalent opening (EPA Region IX).

Gila Box Riparian National Conservation Area (RNCA). A special management area designated by Congress to conserve, protect, and enhance the riparian and related natural and cultural resource values of the Gila River and Bonita Creek.

Graben. An elongate, relatively depressed trough or basin that is bounded by high-angle, normal faults on its long sides.

Granitoid. A granitic rock.

Groundwater Gradient. Direction of flow of groundwater.

Groundwater Table. The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

Growth Media. A substance or material that promotes or supports vegetation.

Hohokam. Prehistoric people inhabiting southern and south-central Arizona and Northern Mexico that primarily lived along the banks of the Gila, Salt, and Santa Cruz rivers.

Holocene. An epoch of the Quaternary period, from the end of the Pleistocene, approximately 10 thousand years ago, to the present time.

Hydraulic Conductivity. The capacity of a rock to transmit water. It is expressed as the volume of water at the existing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

Hydraulic Gradient. Change in head per unit of distance measured in the direction of the steepest change.

Hydrothermal. Of or pertaining to hot water, to the action of hot water, or to the products of this action, such as a mineral deposit precipitated from a hot aqueous solution; also, said of the solution itself.

Igneous. Rock or mineral that solidified from molten or partly molted magma; processes relating to or resulting from the formation of such rocks.

Impact. A modification in the status of the environment brought about by the action.

Indirect Impact. Effects caused by the action and are later in time or are farther removed in distance but are still reasonably foreseeable; indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate and related effects on air and water and other natural systems, including ecosystems.

Infrastructure. The basic framework or underlying foundation of a community, or project including road networks, electric and gas distribution, water and sanitation services, and facilities.

Institutional Controls. Controls including deed restrictions to protect public safety, fencing district, and physical control of access.

Interdisciplinary (ID) Team. A group of agency resource specialists with various backgrounds who are responsible for preparation and review of the NEPA document for a proposed federal action.

Lacustrine. Pertaining to, produced by, or inhabiting a lake or lakes.

Laramide Age. A time of deformation, typically recorded in the eastern Rocky Mountains of the U.S., whose several phases extended from the late Cretaceous period until the end of the Paleocene epoch.

Leaching. Extracting a soluble metallic compound from an ore by selectively dissolving it in a suitable solvent, such as weak sulfuric acid.

Leasable Minerals. Those minerals or materials designated as leasable under the Minerals Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium, sodium, oil, and gas. Geothermal resources are also leasable under the Geothermal Steam Act of 1970. Development of these minerals on public lands requires that a royalty be paid to the U.S. government.

Line. The path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture. Within landscapes, lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches.

Lithic Artifact. Pertaining to, or made of stone.

Lithologic Unit. A unit of rock that can be described on the basis of such characteristics as color, mineralogic composition, and grain size.

Locatable Minerals. Any mineral that can have a mining claim filed on it under the Mining Law of 1872 as amended, e.g. copper, gold, silver.

Long-Term Management Area (LTMA). A designation used by the BLM Safford Field Office for geographic areas within the district as identified in the amended RMP in which the BLM seeks to retain or acquire lands in order to maintain its long-term management presence.

Mafic. Said of igneous rocks rich in dark-colored iron and magnesium minerals.

Mano. Stone tool used for grinding.

Metamorphic Rock. Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in the solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the earth's crust.

Metate. A flat stone with a depression for holding maize or other grains to be ground.

Mineral Entry. Authority to enter public lands for the purposes of developing minerals in an orderly, organized manner.

Mineralized Area. An area that has exposures or sub-surface deposits of potentially valuable minerals.

Mineralizing Unit. A lithological unit responsible for introducing economic minerals into adjacent rocks.

Mining Activity. Any activity directly involved in mineral exploration, development or production at or on an exploration operation or mining unit.

Mining District. A section of country, usually designated by name, that has described or understood boundaries where minerals are found and mined under rules and regulations prescribed by the miners, consistent with the Mining Law of 1872.

Mining Notice of Intent (NOI). Similar to a Mining Plan of Operations but applies only to activities involving no more than five acres of surface disturbance of federal lands.

Mining Plan of Operations (MPO or also Plan of Operations). As required by 43 CFR 3809; Operators submit plans of operation to the BLM that outline the name and address of the operator; location of the proposed area of operation; and information sufficient to describe the type of operation proposed, the type and standards of roads, the means of transportation to be used, the period when the proposal will take place, and measures to be taken to meet the requirements for environmental protection.

Miocene. An epoch of the Tertiary period, after the Oligocene and before the Pliocene covering a span of time from about 23 to 5.5 million years ago.

Mitigation. Mitigation includes a) avoiding the impact altogether by not taking a certain action or parts of an action, b) minimizing impacts by limiting the degree or magnitude of the action and its implementation, c) recertifying the impact by repairing, rehabilitating, or restoring the affected environment, d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, e) compensating for the impact by replacing or providing substitute resources or environments.

National Environmental Policy Act (NEPA). Legislative act passed in 1969 as the national charter for analysis of impacts of federal actions upon the quality of the human environment. NEPA establishes policy, sets goals, and provides means for carrying out the policy. Regulations from 40 CRF 1500-1508 implement the act.

National Historic Preservation Act (NHPA). An act that provided the administrative and legislative power to carry out the spirit and intentions of the Historic Sites Act of 1935 and expand its policies to include protection and preservation of significant historic properties.

National Pollutant Discharge Elimination System (NPDES). A water quality management program overseen by the Environmental Protection Agency involving permitting for point source dischargers to waters of the United States.

National Register of Historic Places (NRHP). A list, kept by the Secretary of the Interior, of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.

Native Species. Organisms that originated in the area in which they are found, i.e., they naturally occur in that area.

Normal Fault. A fault in which the hanging wall appears to have moved downward relative to the floorwall. The angle of dip is usually 45-90 degrees.

Notice of Decision (NOD). A formal notification of an agency decision published in the Federal Register; e.g., the agency decision in the realty process regarding the disposal or acquisition of lands.

Notice of Exchange Proposal (NOEP). Notification of a realty action, a proposed land exchange, that is published in the federal register per the requirements of FLEFA and FLPMA.

Notice of Intent (NOI). First formal step in the EIS process, consisting of a notice published in the Federal Register that an Environmental Impact Statement will be prepared and considered for a proposed action.

Offered Lands. The privately owned lands that are being offered in exchange for public lands in a land exchange; cf. "selected lands."

Oligocene. An epoch of the Tertiary period, after the Eocene and before the Miocene covering a span of time from about 35 to 23 million years ago.

Operator. Any person who directs mining activity at an exploration operation mining unit.

Ore. A mineral deposit of high enough quality to be mined at a profit.

Overburden. Rock and soil cleared away before mining.

Overstory. The upper most layer of vegetation.

Paleocene. The first epoch of early Tertiary period, after the Cretaceous period and before the Eocene epoch, covering a span of time from about 65 to 55 million years ago.

Partial Pit Backfill. Placing development rock in a mined-out pit to less than the capacity of the pit.

Patent. A document conveying title to land from the U.S. government to private ownership.

Patented Claims. Federal mineral claims that have become private lands secured from the U.S. government by a private entity through compliance with the Mining Law of 1872.

Petroglyph. Literally, a rock carving; it usually excludes writing and therefore is of prehistoric of protohistoric age.

pH. The measure of the acidity or basicity of a solution.

Pictograph. A painting or drawing on a rock wall or the like by ancient or prehistoric peoples.

Pleistocene. An epoch of the Quaternary period, after the Pliocene and before the Holocene. It began about two million years ago and lasted until the start of the Holocene some 10,000 years ago.

Pliocene. An epoch of the Tertiary period, after the Miocene and before the Pleistocene, covering a span of time from about 5.5 to 2 million years ago.

Polychrome Sherd. Multicolored pottery fragmentation.

Precambrian. All geologic time, and its corresponding rocks, before the beginning of the Cambrian period of the Paleozoic era (about 570 million years ago); it is equivalent to about 90% of geologic time.

Pregnant Leach Solution (PLS). Solution from the leaching process that contains dissolved metals.

Priority Species. Animal and plant species and habitats having special significance for management. These include endangered, threatened, and special status species; species of high economic or recreational value; and aquatic, wetland, and riparian habitats. Also included are populations of animals or plants recognized as significant for one or more factors such as density, diversity, size, public interest, remnant character, or age.

Project Alternatives. Alternatives to the proposed project developed through the NEPA process.

Pyroclastic. Pertaining to clastic rock material formed by volcanic explosion or aerial expulsion from a volcanic vent; also, pertaining to rock texture of explosive origin. It is not synonymous with the adjective "volcanic".

Quartz Monzonite-Granadiorite Porphyry. A granitic rock in which quartz comprises 10-50% of the felsic constituents, and in which the alkali feldspar/total feldspar ratio is between 35% and 65%; the approximate intrusive equivalent of rhyodacite.

Quaternary. The second period of the Cenozoic era, consisting at the Pleistocene and Holocene epochs. Following the Tertiary; also, the corresponding system of rocks. It began two to three million years ago and extends to the present.

Reclamation. Measures that are taken on surface disturbances at exploration operations and mining units to achieve stability and safety consistent with postmining land use objectives specified in the Reclamation Plan.

Record of Decision (ROD). A public document that reflects the agency's final decision on a proposed project, rationale behind that decision, and commitments to monitoring and mitigation.

Refugia. An area, usually more or less isolated, which with respect to fauna and flora, has remained relatively unchanged in contrast to surrounding areas which have been markedly affected by environmental changes; a refuge

Reserves. Identified resources of mineral-bearing rock from which the mineral can be extracted profitably with existing technology and under present economic conditions.

Resource Conservation Area (RCA). A management designation that provides management consideration to areas with special resource values.

Resource Management Plan (RMP). A planning document developed by the BLM that provides guidelines and direction for making land tenure decisions for short-term and long-term management of public lands and resources within a district.

Rhyolite. An extrusive igneous rock; the extrusive equivalent of granite.

Right-of-way (ROW). A legal right to use, occupy or access land or water areas for specified purposes.

Riparian. Plant communities occurring in association with any spring, lake, river, stream, creek, wash, arroyo, or other body of water or channel having banks and bed through which waters flow at least periodically to perennially. These habitats are generally characterized or distinguished by a difference in plant species composition or an increase in the size and/or density of vegetation as compared to upland areas.

Riprap. Large fragments of broken rock. Thrown together irregularly (as offshore or on a soft bottom) or fitted together (as on the downstream face of a dam). Its purpose is to prevent erosion by water and thereby preserve a surface, slope, or underlying structure. It is used for irrigation channels, river-improvement works, spillways at dams, and sea walls for shore protection.

Roadfill. Fill material used to bring the roadbed to a level elevation.

Runoff. That part of precipitation that appears in surface streams; precipitation that is not retained on the site where it falls and is not absorbed by the soil.

Sacred Site. Any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such as site.

Salable Minerals. Common variety minerals used mostly for construction projects (e.g. sand and gravel). These are disposed of by the government either through sales or special free-use permits to non-profit organizations.

Salada. A term used in the southwestern U.S. for a salt-covered plain where a lake has evaporated.

Scope. Scope consists of the range of actions, alternatives, and impacts to be considered in the Environmental Impact Statement.

Scoping. The process of involving potentially interested and/or affected parties in identifying the issues of concern that will be addressed in the EIS.

Section. A one-square-mile area (640 acres) forming one of the 36 subdivisions of a township.

Seining. To fish using a seine (vertical net).

Selected Lands. The publicly owned lands that have been selected by the project proponent for acquisition in a land exchange; cf. "offered lands".

Sensitive species. Those species designated by a BLM State Director, in cooperation with a state agency responsible for managing the species, as sensitive. Sensitive species are those species (1) under status review by the Fish and Wildlife Service/National Marine Fisheries Service; (2) whose numbers are declining so rapidly that federal listing may become necessary; (3) with typically small and widely dispersed populations, or; (4) inhabiting ecological refuge or other specialized or unique habitats.

Shaft. A vertical opening to an underground mine.

Sherd. A fragment of prehistoric pottery.

Silicic. Said of a silica-rich igneous rock or magma (not a mineral).

Sill. A tabular igneous intrusion that parallels the planar structure of the surrounding rock.

Solution Extraction. Also called solvent extraction. The processing of the pregnant leach solution to produce raffinate and copper-loaded organic.

Solution Extraction/Electrowinning (SX/EW). A process to extract practically pure copper from sulfuric acid solution that has been percolated through stockpiles of copper-bearing rock. The process consists of four steps: leaching stockpiles with acid, extracting copper from leaching solution to produce "loaded organic," mixing electrolyte with loaded organic to produce "rich electrolyte," and passing electric current through rich electrolyte to winnow out the pure copper. This process replaces the need for a smelter for oxidized ores.

Special status species. A grouping of wildlife species that includes proposed species, threatened and endangered species, candidate species, state listed species, and sensitive species.

Species. A group of individuals of common ancestry that closely resemble each other structurally and physiologically, and in nature interbreed producing fertile offsprings.

Stability. The condition of land with respect to its erosion potential and ability to withstand seismic activity.

Stock. Term generally referring to cattle, as in livestock.

Stockpile. An accumulation of ore, stone, or other mined or quarried material, which provides a steady source of supply for the processing plant.

Storativity. The volume of water that is either stored or discharged from a saturated aquifer per unit surface area per unit change in head.

Stratification. The layered structure of sedimentary rocks.

Sub-grade. Underlying surface upon which facilities such as leach pads, rock stockpiles, roads, etc. are constructed.

Submergent Plant. A plant growing in water. The entire plant remains below the surface of the water.

Substation. A facility in an electrical transmission system with the capacity to route control electrical power and to transform power to a higher or lower voltage.

Surfactant. A chemical that modifies the surface tension of a liquid, changing the way bubbles form and burst.

Surge Pile. Stockpile used to temporarily store excess crushed ore.

Tailings. The remains of milled ore that are regarded as too poor to be treated further.

Texture. The visual manifestations of the interplay of light and shadow created by the variations in the surface of an object or landscape.

Threatened Species. Any species of plant or animal that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Total Dissolved Solids (TDS). Total amount of dissolved material, organic or inorganic, contained in a sample of water.

Total Suspended Solids(TSS). Amount of undissolved particles suspended in liquid.

Traditional Cultural Property (TCP). A physical property that may be eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Transmissivity. The amount of water that can flow horizontally through the entire saturated thickness of the aquifer under a hydraulic gradient of 1 m/m.

Tuff. General term for all consolidated pyroclastic rocks.

Understory. Lower-most vegetation layer of an area.

Unmineralized. Lacking economic mineral content.

Unnecessary or Undue Degradation. As defined at 43 CFR 3809.0-6(k), "surface disturbance greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations

on other resources and land uses, including those resources and uses outside the area of operations."

Uplands. Areas outside riparian zones.

Valid Existing Rights. Legal interests attached to land or mineral estate that cannot be divested from the estate until that interest expires or is relinquished.

Visual Resource Management (VRM) Classes. Classification containing specific objectives for management of visual resources, including the kinds of structures and modifications acceptable to meet established visual goals.

Visual Resources. The visible physical features on the landscape (land, water, vegetation, and structures); scenery.

Volatile Organic Compounds (VOCs). Organic compounds which participate in atmospheric photochemical reactions except for those designated by the EPA Administrator as having negligible photochemical reactivity.

Waters of the U.S. A term from Section 404 of the Clean Water Act referring to water bodies such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds. The use, degradation, or destruction of these waters could affect interstate or foreign commerce and is under the jurisdiction of the U.S. Army Corps of Engineers.

Watershed. The geographic region from which water drains into a particular stream, river, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges or divides separating them.

Water Table. The level in the saturated zone at which the pressure is equal to the atmospheric pressure.

Wetlands. Areas that are inundated by surface or ground water with a frequency sufficient to support (and under normal circumstances do or would support) a prevalence of vegetation or aquatic life that required saturated or seasonally saturated soil conditions for growth and reproduction.

Wild and Scenic River. A river designated under the authority of the National Wild and Scenic Rivers Act of 1968 to preserve the free-flowing character of the river and its outstandingly remarkable natural and cultural resource values.

Wild and Scenic Rivers Act. Act passed by Congress in 1968 to preserve in free-flowing condition and to protect for the benefit and enjoyment of present and future generations certain selected rivers of the Nation which possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

Wilderness. An area formally designated by Congress as part of the National Wilderness Preservation System. A wilderness, in contrast with those areas where people and their works dominate the landscape, is recognized as an area where the earth and its community of life are untrammeled, where people visit but do not remain. It is an area of undeveloped land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by forces of nature, with the imprint of human's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired conditions; and (4) may also contain ecologic, geologic, or other features of scientific, education, scenic, or historical value.

Xeroriparian. Riparian habitats generally associated with an ephemeral water supply. These communities typically contain plant species also found in upland habitats; however, these plants in xeroriparian habitats are typically larger and/or occur at higher densities than in adjacent uplands.

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ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
af/yr	acre-feet per year
AGFD	Arizona Game and Fish Department
ANFO	Ammonium nitrate and fuel oil
APP	Aquifer Protection Program
ARS	Arizona Revised Statutes
ASM	Arizona State Museum
ATI	Agreement to Initiate a Land Exchange
AUM	Animal Unit Month
AWQS	Arizona Water Quality Standards
BADCT	Best Available Demonstrated Control Technology
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
COE	Corps of Engineers
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DOI	Department of Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FIRE	Finance, Insurance, and Real Estate
FLEFA	Federal Land Exchange Facilitation Act
FLPMA	Federal Land Policy and Management Act
gpd	gallons per day
gpm	gallons per minute
HDPE	High-density polyethylene
H_2SO_4	sulfuric acid
IBLA	Interior Board of Land Appeals
ID Team	Interdisciplinary Team
kV	kiloVolt
LOS	Level of Service
LTMA	Long-Term Management Area
LUST	Leaking Underground Storage Tanks
LWCF	Land and Water Conservation Fund
$\mu g/m^3$	micrograms per cubic meter
MPO	Mining Plan of Operations
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native Am. Graves Protection & Repatriation Act
NCA	National Conservation Area, including RNCAs
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	unspecified form of nitrogen oxide
NOA	Notice of Availability
NOD	Notice of Decision
NOI	Notice of Intent to Prepare an EIS
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
OSHA	Occupational Safety and Health Administration
PD	Phelps Dodge (parent corporation)
PDSI	Phelps Dodge Safford, Inc.
PILT	Payment in Lieu of Taxes
PLS	Pregnant Leach Solution
PM	Particulate Matter
PM_{10}	Particulate Matter of 10 microns or less in aerodynamic diameter
$PM_{2.5}$	Particulate Matter of 2.5 microns or less in aerodynamic diameter
PMLU	Post-mining land use
RCA	Resource Conservation Area
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
RNCA	Riparian National Conservation Area (subset of NCA)
ROD	Record of Decision
ROM	Run-of-Mine
ROW	Right-of-way
SCS	Soil Conservation Sevice
SO_2	sulphur dioxide
SPCC	Spill Prevention Control and Countermeasure Plan
SX/EW	Solution Extraction/Electrowinning
TCP	Traditional Cultural Property
tpd	tons per day
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tanks
W&SR	Wild and Scenic Rivers
WQARF	Arizona Water Quality Assurance Revolving Fund (WQARF) site
WSCA	Wildlife Species of Concern in Arizona
VOC	Volatile Organic Compound
VRM	Visual Resource Management
zipACIDS	Arizona CERCLA Information and Data System sorted by postal zip code

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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OFFICIAL BUSINESS
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